WORLD PETROLEUM

DECEMBER 1958

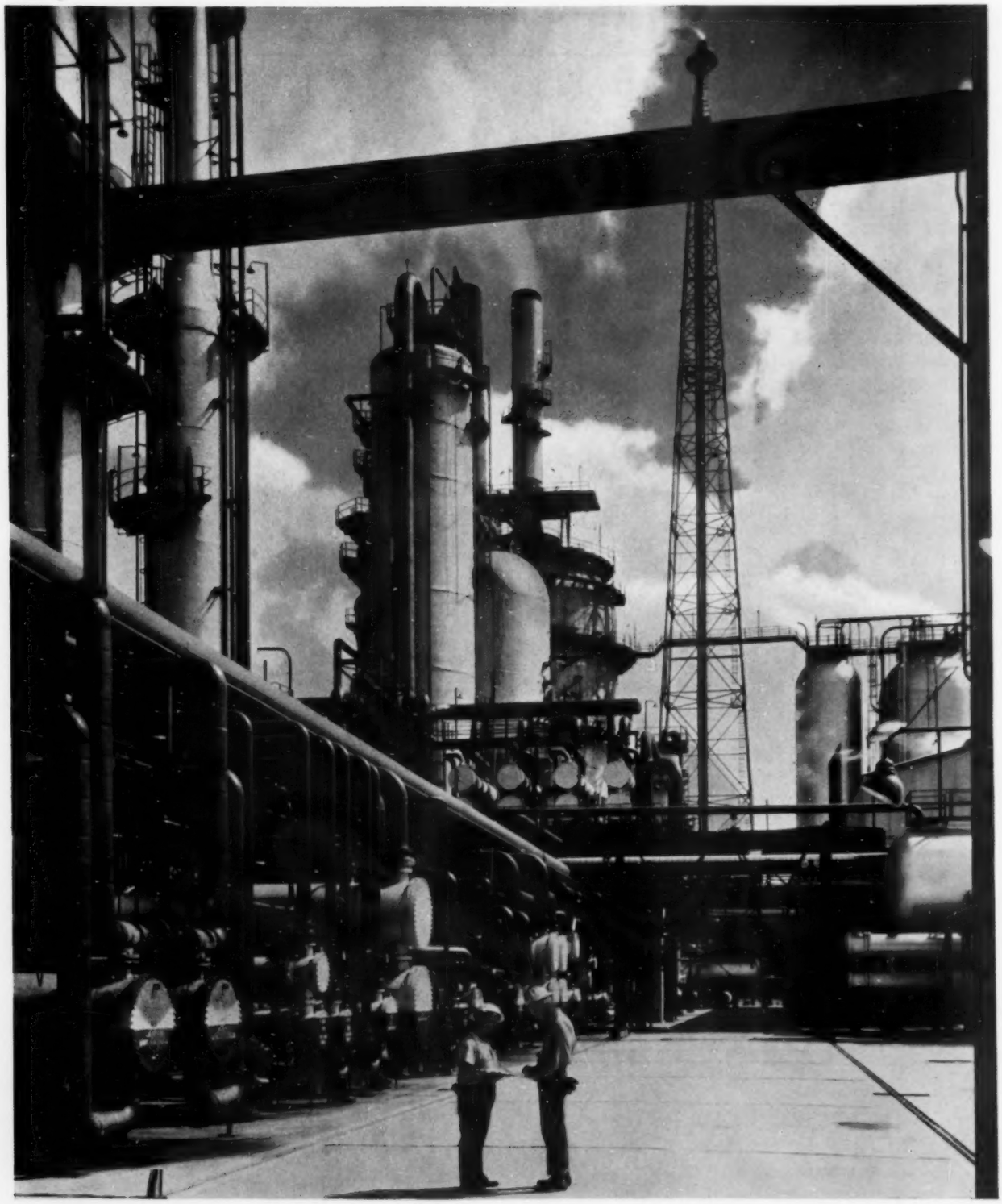

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table of contents page 3

Oil now largest USA investment abroad—Pg. 64

Conflict and promise in Colombia in 1958—Pg. 38

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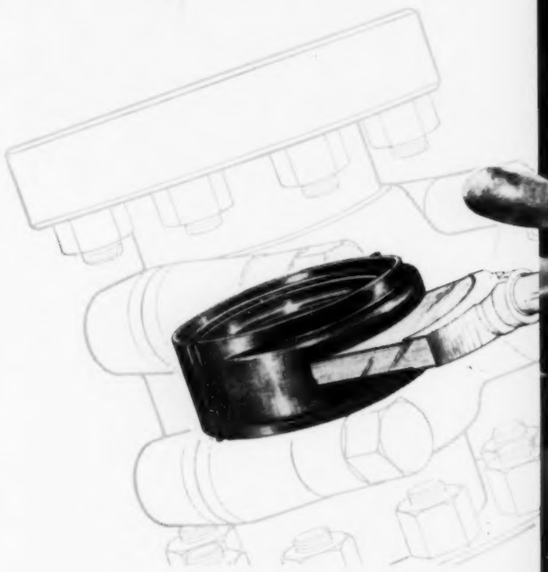

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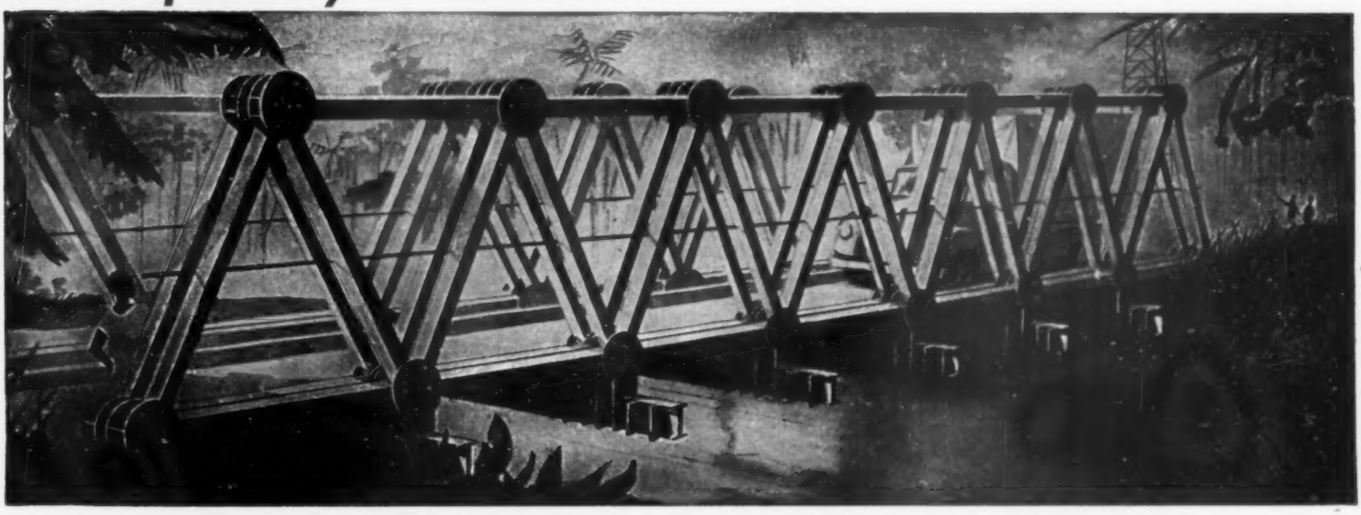

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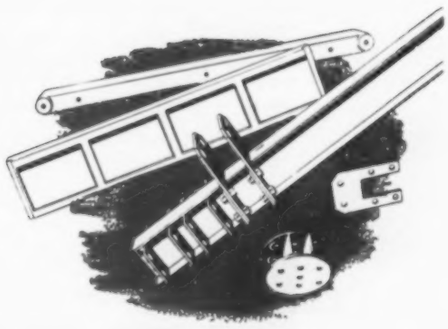

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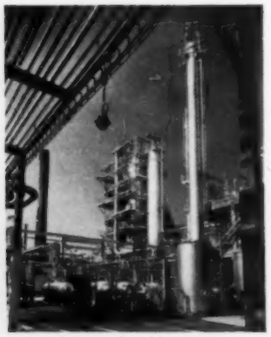

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CONTENTS

4 Washington Pipeline, *by Joseph B. Huttlinger*

6 London Letter, *by A. L. Paget*

10 Latin American Oil News

12 Canadian Notes

37 Editorial—Argentina's Welcome Mat Is Out Again

38 Conflict and Promise in Colombia, *by E. Ospina-Racines*

44 Venezuela's Oil Industry is Sound

48 First Borden Report Proposes Close Controls in Canada

49 Philippine Petroleum Possibilities, *by Chester A. Baird*

58 Swan Hills Find Boosts Canada's Reserves, *by Alex Clark*

62 Review of World Oil Law and Concession Changes in 1958—Part II: Europe

64 Oil Now Largest USA Investment Abroad, *by Dillard Spriggs*

66 Australian Oil Hunt, *by R. C. Sprigg*

74 Petrochemical Horizons for Propylene—Part IV, *by Peter W. Sherwood*

81 Miniature Rock Bits Simulate Deep-Well Drilling

86 Oil Company Staff Changes

88 International News and Notes

100 Advertisers' Index

THIS MONTH'S COVER

Fluid Catalytic Cracking unit at the Port Arthur, Texas, refinery of Gulf Oil Corp., one of the world's largest refineries. The cracking unit shown has a capacity of 60,000 b/sd. Photograph is by J. C. Watkins and color plates are produced through the courtesy of Donald C. White, editor of *The Orange Disc*, house magazine of the Gulf companies.

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Washington

By Joseph B. Huttlinger

NPC To Meet Again

National Petroleum Council leaders have decided to operate under the new rules proposed by Secretary of the Interior Fred Seaton, and now aim at a meeting in December in Washington. This would make the first meeting since October 1957. Usually meetings are held each three months.

Final decision to try to work under the new rules came after a letter from Secretary Seaton to Hines H. Baker, executive vice president of Standard Oil Co. (N.J.), saying among other things: "I consider it very important that the National Petroleum Council be convened at an early date so that it may resume its role as an extremely important advisory group." Seaton promised to be "open-minded" to further changes if actual experience shows changes are needed.

Mr. Seaton first proposed that a government official be chairman. Presently, he insists only upon a government co-chairman with powers "equal" to those of the industry chairman. Mr. Seaton claims rules of the Department of Justice call for the government to have control of industry advisory groups.

100th Anniversary Stamp

The USA government has taken note of the 100th anniversary of the modern oil industry next year. The Post Office Department says it will issue a "petroleum industry" stamp, August 27, 1959, at Titusville, Pa., commemorating the occasion.

Canadian View Of Import

John White, president of Imperial Oil Ltd., Toronto, feels USA voluntary program to limit crude imports already is having "a direct and immediate harmful effect on the Canadian oil industry." He thus disagreed with other of the 50 members of the Canadian-American committee, who stated in a report that the voluntary program has merely "threatened" Canada's industry.

Mr. White gave his views in a footnote to a committee report which was released as the committee opened its third annual meeting, October 24, in Quebec City. Aim of the committee is to achieve "more harmonious commercial relations between the two countries."

Other oil men on the committee are Stanley C. Hope, former president of Esso Standard Oil Co., New York; and Charles A. Perlitz, executive vice president of Continental Oil Co., Houston.

Agenda for the committee included two energy reports—one on whether Canadian oil should be carried to the Montreal market or moved to the USA West Coast and Midwest; and a second on markets for Canadian natural gas.

Pipeline

Mr. White said the USA system of quotas on Canadian oil is a "reversal of the continental pattern of defense" and has reduced the willingness of investors to move into Canadian oil development by adding a new risk. He also said the mechanics of the quota system channels crude imports to suppliers "able to sell crude at substantially lower prices." Only little of USA imports, he said, "will come from any area where North American systems of operation and North American levels of cost apply." He added the defense quotas "militate against Canada, one of the regions most vital to USA defense."

Puerto Rico To Cooperate

Puerto Rican officials have promised to use their influence to support the voluntary program to limit crude imports to the USA. Teodoro Moscoso, commonwealth economic administrator, wrote Capt. M. V. Carson, Jr., oil imports administrator, stating that Puerto Rico would not grant tax exemption to any new oil refinery during the duration of the voluntary program and would revoke existing tax exemptions for the two existing refineries if they violate the import program.

Pipeline Rate Methods

The US Supreme Court has agreed to hear arguments into a Department of Justice challenge into methods used by some oil pipeline companies in calculating dividends allowed to shipper owners. The DJ accused Arapahoe Pipe Line Co. of using borrowed capital as part of the valuation base in figuring the 7% return allowed under the 1941 consent decree under the Elkins act. DJ said borrowed capital should not be included.

DJ also complained of methods used by Service Pipe Line Co., which figured valuation on a pro-rata basis, instead of at the end of the year; and Tydol Pipe Line Co., which included property used but not owned. A fourth case, against Texas Pipe Line Co., was settled out of court.

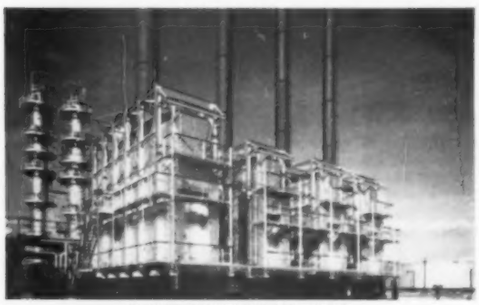
US District Judge Richmond B. Keech handed down a bench ruling earlier this year against the DJ in each of the three cases. He said the DJ should not have waited so long, and that the consent decree is clear on its face.

Atomic Submarines

The Department of Defense wants the oil industry to join in a study of the nuclear submarine and what it means to future military demands for diesel fuel. By 1961 Captain V. R. Glocheski, head of the petroleum section of the Office of the Chief of Naval Operations, thinks navy diesel-oil requirements may fall 300,000 bbl to 500,000 bbl per year.

(Continued of page 94)

CRUDE HEATERS, VENEZUELA



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LONDON LETTER

Camco In Northern Ireland

The Northern Ireland Development Council announces that CAMCO Inc., of Houston, Texas, is establishing a wholly owned subsidiary in Belfast. CAMCO Ltd., as it is to be known, will manufacture Camco equipment for export to all the oil-producing areas of the world except the United States. Production was planned to begin early in December in an 18,000-sq-ft government advance factory on the Carnmoney industrial estate on the outskirts of Belfast. It is estimated 60 men will be employed, with the prospect of subsequent expansion. Camco, which is the eighth American firm to establish manufacture in Northern Ireland, produces gas-lift valves and allied equipment. Camco has sales and service organizations in North and South America, and purposes to extend its coverage from the Belfast headquarters to the oil-producing areas of Europe, Asia, and Africa.

William M. Edwards, Camco Inc. vice president, who will be managing director of Camco Ltd., is moving to Belfast with his family. He has been with Camco Inc. since its inception in 1946. Dale E. Johnson, export manager of Camco Inc., will be a director of Camco Ltd. and in charge of sales. He, too, will reside in Belfast.

"Open House" At Coryton Refinery

In a novel scheme to explain its determination to be a "good neighbor," Mobil Oil invited the public to visit Coryton refinery during four "open house" days in October. More than 1,500 applications from local residents in the Southend area and initial success of this venture suggest the company may extend the scheme to other areas along the north bank of the Thames. Coryton has already been visited by a number of civic personalities and the member of Parliament for southeast Essex, Bernard Braine. The aim of these visits is to explain refinery operations to local inhabitants, and to explain the "good neighbor" policy particularly as regards the precautions taken to combat atmospheric pollution. Each tour will take about three hours: and will include time for discussion, when questions will be answered by members of the refinery staff.

£6 Million Chemical Plant

John Maclay, the secretary of state for Scotland, started the latest expansion of British Hydrocarbon Chemicals' works at Grangemouth by driving the first pile of a £ 6 million project to build a third ethylene plant. Capacity for the production of olefins for the manufacture of petroleum chemicals by British Hydrocarbon, which is a joint undertaking of BP and the Distillers Co., will be more than doubled by the installation of the third plant. Due to be completed by 1960, it will have a capacity of some 70,000 tons a year.

This third plant will have a capacity greater than that of the first and second units combined, and will be the largest of its kind outside the United States. The additional ethylene produced will enable existing ethylene utilization plants and the "Rigidex" polythene plant now under construction to be operated at full capacity. Sufficient ethylene and other olefins also will become available to enable a further program of development. With the completion of the project and of the polyethylene and phenol plants now under construction, the total investment by British Hydrocarbon will amount to over £ 30 million.

Synthetic Rubber

The International Synthetic Rubber Co. estimates its new £ 6 million plant near Southampton, now in full operation, can save Britain more the $25 million annually on hitherto essential imports. This plant, claimed to be the most modern of its type in the world, is Britain's first venture into the bulk manufacture of general-purpose synthetic rubber. It makes the UK independent of overseas sources of this material. About 12,000 tons of a production capacity of 70,000 tons a year are earmarked for direct export, and there will be further exports of the articles manufactured from its output.

D. A. Bennett, ISR general manager, said the company was "most certainly" prepared to extend its works and expand its output if home and overseas demands require it. "There is room to double or treble production if necessary," Mr. Bennett added.

The plant, occupying a 54-acre site and with installations covering 280,000 sq ft, was built in 16 months and first started production in March 1958, reaching full output in July. The £ 4 million equity capital of ISR was subscribed by the UK tire companies, which also continue to provide research information on synthetic rubber, now used in the manufacture of all motor-car tires as complementary to natural rubber. ISR produces styrene-butadiene rubber, known as S-BR. The Fawley refinery of Esso provides the butadiene which is piped the 1-¾ miles to the ISR plant on Southampton Water. Forth Chemicals, at Grangemouth, and Shell, at Partington, provide the styrene. Blaw-Know, of Pittsburgh, USA, was commissioned to design and install the plant which incorporates a number of exclusive features. Matthew Hall, of London, and John Laing looked after the civil engineering work. Some 400 employees keep the plant operating continuously night and day. The brand name for ISR is Intol, of which there are three main types with differing properties.

The 70,000-ton output capacity of ISR is estimated as 27% of total UK demand for rubber of all types, including natural rubber. Company chairman G. E. Beharrell stressed that natural and synthetic rubber were complementary. He put over three million tons a year the present total world demand for natural and synthetic rubber. Natural rubber was produced at a rate of 1.8 million tons a year and, therefore, could not satisfy full demand. Neither was the output of synthetic manufacture capable of meeting all requirements. In the full field of uses, he suggested, natural rubber could claim about one-third of demand, synthetic rubber another third, and the remaining third was an area of competition between the two.

Drilling Barge Launched

The first oil drilling barge to be built in the United Kingdom was launched, October 13, at Southampton. The barge was constructed for the Shell Co. by Steel Structures, and is worth about £ 1 million. It is 190 ft long, 106 ft wide, and weighs more than 3,000 tons; it is capable of drilling 15,000 ft below the sea bed. It will have its own heliport and airconditioned accommodation for a crew of 30. It is expected the barge will be handed over to Shell at the end of the year. It will then be towed 14,000 miles to Borneo for use in offshore drilling operations.

Australian Synthetic Petrol

By 1963, Australia hopes to be producing 80 million gallons of synthetic petrol (motor spirit) annually from brown coal mined at Morwell, 89 miles from Melbourne. Early in September, the first synthetic petrol to be produced in Australia was made at a Melbourne laboratory. The Melbourne Gas & Fuel Corp. announced its plant, scheduled to start operations in 1963, should produce enough petrol for Victoria's primary producers. Australia's overall petrol consumption is 200 million gallons annually. G. E. Barrow, development manager of the company, said "synthetic petrol will cost more to produce than ordinary petrol, but we cannot give figures yet. It will depend on how cheaply we can produce gas." He explained it would take roughly 40 lb of brown coal to produce just over one gallon of petrol.

Vickers-McKay Ltd.

A new company, called Vickers-McKay Ltd., has been formed by The McKay Machine Co. of Youngstown, Ohio, USA, Vickers-Armstrongs (Engineers) Ltd., and Rockwell Machine Tool Co. Ltd., to manufacture in the United Kingdom and market throughout the world a wide range of McKay machinery. Directors of the company are R. Wonfor (chairman); W. M. Briggs, C. E. Rockwell, and A. J. Wardle, Jr.

Registered office of the company will be at Vickers House, Broadway, Westminster, London, S.W.I. Manufacture of this machinery will be carried out at the works of Vickers-Armstrongs (Engineers) Ltd. Sales will be carried out by Rockwell Machine Tool Co. Ltd. of Welsh Harp, Edgware Road, London, N.W. 2.

Personals

A. O. MILNE, formerly manager of the Liverpool repair works of Harland & Wolff Ltd., has been appointed deputy to H. R. Humphreys, general manager of the company's repair works, with headquarters in London. Mr. Milne will take up his duties early in the new year **J. FARNIE**, formerly of the Esso Petroleum Co. Ltd., was appointed manager of the Liverpool works to succeed Mr. Milne.

SIR ALEXANDER McCOLL, former chairman of Mobil Oil Co., on the occasion of his 80th birthday this year, was entertained at luncheon by the present chairman, J. C. Gridley, and his fellow-directors. Sir Alexander joined Vacuum Oil Co., as Mobil was then known, in 1905. In 1912 he became sales manager; in 1919 a director; in 1932 deputy chairman; and in 1936 was elected chairman. For his outstanding services to the government in World War II, he was rewarded with a knighthood in 1946. Although he has devoted most of his career to the petroleum industry, Sir Alexander has had wide business experience in other spheres. He is also head of the Clan McColl; past president of the London Ayshire Socy.; and vice president of the Scottish Council (development in industry), in which capacity he has been closely connected with the establishment of 150,000 new jobs in Scottish industry. He and Lady McColl live at Totteridge, Hertfordshire.

ARTHUR FRANKS, a director of the Castrol oil firm, and his wife celebrated their golden wedding, September 25. On behalf of the board, L. M. Broadway, deputy chairman and managing director of C. C. Wakefield & Co. Ltd., presented them with a set of gold napkin rings. Mr. Franks has been connected with the oil industry for 55 years.

C. K. STRINGER, managing director, Power Petroleum Co., retired on October 31. He will be succeeded by G. B. Howard-Rice who, until recently, was establishment services manager for Shell Mex-BP.

Sir Leonard Sinclair

SIR LEONARD SINCLAIR, chairman of Esso Petroleum Co. Ltd. since 1951, this year completed 50 years' continuous service. Sir Leonard joined the Anglo-American Oil Co., as Esso then was known, as a junior clerk in Manchester the day before his 13th birthday in 1908, at a monthly salary of £1 10s 4d (at that time about $7.50). He saw active service in World War I and, on rejoining the company, became a sales representative. In 1927 he was promoted to assistant manager of the Birmingham branch. In 1933, he became assistant general sales manager at the head office, London.

During World War II Sir Leonard was a director of the Petroleum Board, and in 1943 was appointed a director of Esso. Six years later he became a managing director. He has witnessed many radical changes in the industry in the course of his 50 years' service. For instance, it was not until 1920 that the first retail pump was introduced by Esso; until that time gasoline had been sold in 2-gal cans. The large refinery at Fawley was opened in his first year of office as chairman, since when its capacity has been almost doubled and petroleum chemicals, once a by-product, are becoming a major importance. Sir Leonard was knighted in 1955. To commemorate the occasion, employees of the company presented him with his portrait painted by James Gunn, ARA.

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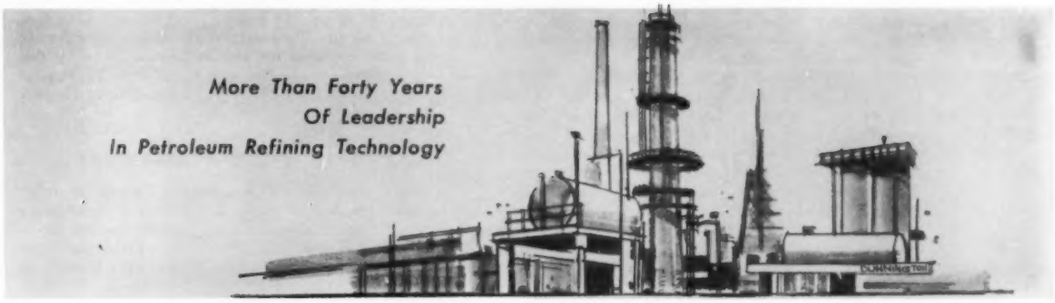

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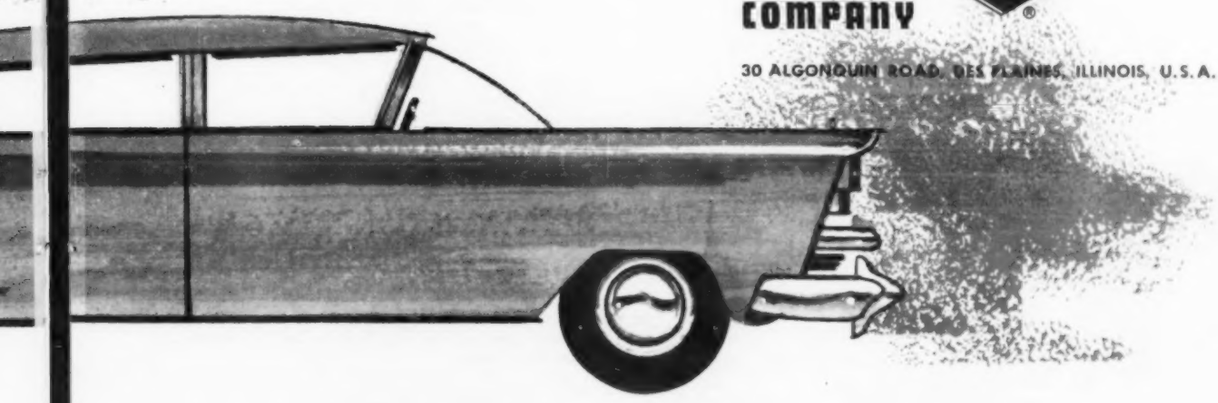

LATIN AMERICAN OIL NEWS

Argentina Hits Contracts

The Argentine Engineers Center says an analysis of contracts between YPF and the Pan American International Oil Co., and between YPF and Carl M. Loeb Rhoades Co., are "excessively rewarding for the companies," according to consular reports to Washington.

Using a number of assumptions, estimates, and guesses, the engineers figure that the companies will be able to produce oil for $6.12 per cubic meter and will receive $10 for it, for a gross profit of $3.88 or 63% of cost.

The engineers also calculate that, for oil received in Buenos Aires, YPF must pay $14 per cubic meter, including $10 to the companies, $2.50 for cost of freight from Comodoro Rivadavia, and $1.50 already invested by YPF in exploration in the area. The center says this is $4 below the import price of $18 per cubic meter, but allows the companies a profit of $3.68 (sic), a split of 53% for Argentina and 47% for the companies.

The center called for "renegotiation" of the two contracts to give YPF a share of "additional profits" which might come if production is unusually high; to untie the Loeb-Rhoadés contract from the cif price of imported crude; to modify the Loeb-Rhoades cancellation clause; to require Pan American to produce oil within a reasonable period of time; and to ease the contradiction which gives preference to Pan American as a supplier of imported oil at the same time obliging it to produce a maximum of oil in the shortest possible time.

To Start Guatemala Test

The Ohio Oil Co. of Guatemala has let contract to Brown International Drilling Co., and expects to have its first exploratory well in Guatemala started by March 15, 1959, according to Fred J. Funk, manager of Ohio's foreign production. The wildcat No. 1 Chinaja is located on the Arruga Grande Anticline, and may go as deep as 13,000 ft.

Brazil's Oil News

Crude production (official), January 1 to September 23, 1958, totaled 12,932,438 bbl (48,618 b/d); October (estimated) 1,829,000 bbl (59,000 b/d). Average production per well in August was 249.5 b/d. Crude production (official) in July of 1,656,931 bbl averaged 53,449 b/d; August, 1,744,122 bbl (56,249 b/d); January 1 to August 31, 11,609,259 bbl (47,774.7 b/d); September, estimated, 1,740,000 bbl (58,000 b/d). A new record was set up, September 1, when production reached 59,016 bbl. The Catu field contributed 37,412 bbl; Candeias, 16,080; D. Joao, 10,411; Mata de Sao Joao, Itaparica, and Paramirim fields supplied the remainder. Another record was set up on October 12, when crude production reached 61,111 bbl. The Catu field contributed 38,822 bbl; Candeias, 16,627. Bahia crude reserves were officially estimated at 438 million barrels at June 30, 1958.

Deep structural well EP-7-BA, in the Bahia Reconcavo west of Candeias, yielded 11 bbl of oil per hour under formation test early in September. Production tests, if satisfactory, will confirm an increase in the Reconcavo productive area.

Dr. Gerson Fernandes, of the Petrobras exploration department, estimates the potentially productive area of the Bahia Reconcavo at 6,500 square kilometers. The area proved by oil wells is 65 square kilometers; the approximate area eliminated by prospecting is 1,300 square kilometers; and the area still to be prospected at 5,135 square kilometers, or 79% of the total.

Petrobras is preparing to drill a stratigraphic well, IT-st-1-RG, in the municipality of Itacurubi, Rio Grande do Sul. This will be the first well spudded in that state.

Another well is being drilled in the Amazon basin, at Carapanatuba, on the Madeira River. 91 rigs operating in October numbered 52; 4 others on hand. In September they numbered 53. In August, 12 geological, 16 seismograph, and 11 gravimetric teams were operating; 18 teams and 14 rigs were operating in Amazonas and Para. One rig was operating under water from a raft in Caxuaiama Bay. Footage drilled, January 1 to August 31, totaled 401,154 ft as against 405,366 in January-December 1957. Wildcat at Taquipe, near town of Sao Sebastiao, in Bahia Reconcavo, produced 300 b/d throughout definite test, revealing new area to be exploited.

"S.S. Presidente Juscelino," Brazil's new 33,000-ton tanker, 660 ft long, the first of a series of four ordered in Holland, was launched by the Verolme consortium, October 11. In September Petrobras invited tenders from European and Japanese shipbuilders for four tankers of 10,000 dwt. Petrobras advises that proposals submitted by firms in USA, England, Germany, France, Italy, Holland, Belgium, Switzerland, and Japan to supply petroleum equipment, valued at over $300 million, are now under consideration.

Petrobras capital is to be raised to 16,000 million cruzeiros from 12,000 million by a new issue of ordinary and preferential shares.

Colonel Nunes has announced: "Brazil's government and private refineries are now producing 160,000 bbl of refined products daily, equivalent to 79% of domestic consumption:

"Amplification of Mataripe plant to 42,000 b/d will be completed in February 1959; construction of Duque de Caxias 90,000 b/d refinery should be completed in 1960.

"The present carrying capacity of the national oil fleet will be more than doubled on delivery of seven supertankers and one 6,000-ton lubricant carriers, now under construction. The last-named should start operating in November next."

Preparations for drilling in Sergipe, northeast Brazil, and Santa Catarina, in the south have been reported unofficially. Petrobras is reported building a road to Fazenda da Cobra Dagua in Pacatuba, Sergipe, to transport the rig and other materials required for drilling. Florianopolis, capital of Santa Catarina, reports first consignments of heavy materials are now reaching Tangara, where Petrobras is preparing to drill.

Petrobras has asked the Soviet Union to send 48,000 tons of Russian oil, in three consignments, to be tested in the State refineries. If satisfactory, it will be included in the order for 200,000 tons to be placed with Soiusneftexport and exchanged with Brazilian cocoa of equivalent value.

The Petroleum Council has fixed the following prices in cruzeiros per liter for liquid fuels to be sold to the public in the Federal Districts: ordinary gasoline, 6.46; special gasoline, type 'b', 9.10; kerosine, 5.32; diesel oil, 3.80. LPGas 16.60 cruzeiros per kilo, delivered at domicile.

Costa Rica Search Continues

Union Oil Co. of California is continuing geological surveys on its concessions in Costa Rica, and expects to resume drilling early in 1959 on the Caribbean coast. Three years of drilling in that area has produced nothing as yet.

Panama Well Dry

Champlin Oil Co., which has been conducting offshore drilling operations in the Bay of Bocas del Toro on the Caribbean coast, has discontinued operations temporarily after reaching slightly over 7,000 ft. It is engaged in moving the rig to a new location in the same area. There are no other known plans for drilling in the near future in Panama by concession holders, although active geological and geophysical work is being engaged in by most of them.

Guatemalan Drilling

Three deep wells are planned to be drilled early in 1959 in Guatemala. To date, only one test well has been drilled in Guatemala. That was by Coastal Plains Oil Co. which went to approximately 7,000 ft before operations were halted.

A contract has been signed with Santa Fe Drilling Co. of Houston by Compania Petrolera California Ltd. to drill early next year; Inversions Guatemaltecos-Americans SA, backed by Texas and Guatemalan joint capital, has signed with Wilson Brothers Oil Co. of Dallas for three drillings in Izabal where the company holds concessions; and Ohio Oil Co. de Guatemala is about to let bids for the contract drilling of Chinaja well No. 1 to a projected depth of 13,500 ft.

Meanwhile, in other developments in the oil business in Guatemala, the government has approved a project by the Breau Bridge Oil Refining Co., of Louisiana, to install a $5 million 3,500 b/d refinery on the Caribbean coast and is considering two other requests for similar permits, one by the Litwin Engineering Co. and the Ralph M. Parson Co. of Los Angeles, to install refineries in Guatemala.

Dowell Enters In Argentina

Plans are being completed by Dowell to offer oil and gas well services in Argentina. Headquarters will be established soon at Commodoro Rividavia, in southermost Argentina. Field manager will be G. T. Lamberson, formerly with Dowell in Illinois and United Oilwell Service in Western Venezuela.

Union's Contract A Model?

Another oil company is being offered a contract by Argentina similar to the one signed by Union Oil Co. of California, raising speculation that the Union contract may be essentially the "model contract" mentioned by President Frondizi, September 26.

Union's contract, covering 16,000 square kilometers, is for 22 years and renewable for another five. Union is to invest at least $5 million during the first two years and $9 million in the next three, which can be reduced to $3 million if no oil is discovered. Union also is required to construct, at its own expense, pipelines from each of its producing areas to YPF's Comodoro Rivadavia fields. At end of the contract period, all equipment and installations become the property of YPF without charge.

The company will receive $12 per cubic meter for petroleum produced and delivered to YPF. Payment will be 60% and dollars and 40% in pesos at the free market rate.

Brazilian Pipelines

Petrobras has been authorized to build and operate an ocean terminal at Arraial do Cabo, municipality of Cabo Frio, state of Rio de Janeiro, with a tank of 80,000 bbl capacity. At the outset, terminal is to store fuel oil; and a line of 16-in. pipes, 2,300 meters long, is to connect with the tanks of Companhia Nacional de Alcalis.

Brazil-Bolivian Bids

The period for Brazilian firms to submit offers to exploit Bolivian oil expired on September 12. Six firms oflered: Uniao Brazil-Bolivia de Petroleo SA; Companhia Petrolifera Brasileira; Petrolanza, Petroleo Andino SA; Petrobol, Petroleo da Bolivia SA; also two groups now being organized.

Argentine Rigs

YPF had about 70 rigs in operation in Argentina at midyear 1958; expects to have 100 by year-end.

Venezuelan Completions

Total well completions in Venezuela in 1958 are expected to drop to 1,400 from the 1,746 in 1957. First-quarter completions were only 327.

British Guiana Offshore

Standard of California's British Guiana subsidiary has been doing exploration work offshore the west coast of British Guiana on its 16,000-square-mile license.

Peru's Marketing

Peru's crude production in the first half of 1958 was 9,124, oil bbl (50,409 b/d); natural gasoline 488,253 bbl—including propane, butane, and hexane. Refinery crude runs totaled 7,769,763 bbl. 1,022,291 bbl of crude moved in Peru's foreign trade, as well as 1,201,220 bbl of oil products.

ACETYLENE FROM NATURAL GAS OR NAPHTHA

Success of the SBA-Kellogg acetylene processes—industry's most advanced approach to the continuous production of high purity C_2H_2—stems mainly from burners developed by Societe Belge de l'Azote.

Burner Type I for natural gas feed, for example, avoids pre-ignition or flashback when gas and oxygen are introduced at economic, elevated preheat temperatures; minimizes heat losses by maintaining flame stability at temperatures as high as 1400-1600K; optimizes yield and prevents overcracking through reaction chamber design; and continuously removes carbon in operation.

Full details on the SBA-Kellogg high purity acetylene processes—designed to use natural gas, naphtha or other liquid feedstocks, and on the process equipment, are contained in a new 6-page Kellogg folder and an 8-page reprint of a detailed article just published in a technical publication. Write Kellogg for your copies.

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CANADIAN NOTES

Athabasca Work Continues

Royalite Oil Co. Ltd. has joined with a major oil company for continuation of Royalite's activities in northern Alberta's oil-sands region. The major company was not identified. Rumors have circulated the company is Shell Oil Co. of Canada, but confirmation or denial could not be obtained from either company. Royalite's announcement stated: "Royalite has conducted extensive research and development in the Athabasca oil sands over the past three years. Arrangements have been completed to join with a major oil company for the continuation of this work."

Drilling Rigs Rise

In early October, there were 177 drilling rigs under contract in western Canada. Some 113 were in use on field development wells and 64 on exploratory tests. Total compares with 176 rigs operating a month earlier.

Alberta activity increased to 127 rigs operating, with 82 on field wells and 45 on wildcats, compared with early September with 73 field wells under way and 49 wildcats. Saskatchewan operations dipped to 37 active rigs, 29 on field wells and eight on exploratory, against early September's 25 field wells and 16 wildcats. In Manitoba two rigs were in operation on field wells, against no activity in early September.

In British Columbia 11 rigs were operating, all on wildcats; while a month earlier, there were 12 on wildcats and one on a field well. No drilling activity has been reported for the Northwest Territories for two months.

As of early October, 52% of the rotary drilling rigs in western Canada were under contract, as there are a total of 340 rigs owned by 70 separate contracting firms or oil companies which operate their own drilling rigs. The total includes 53 companies members of the Canadian Assn. of Oilwell Drilling Contractors and 17 nonmembers. Association members own 89.4%, or 304 of the 340 rigs; while nonmembers have 36 units. All but seven of the rigs at work are owned and operated by members.

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Canada Wells Down

Completion of wells in western Canada came to 1,904 in the first nine months of this year compared with 2,278 in the same period a year ago.

Consular reports say the totals broke down as follows between oil wells, gas wells, and dry holes:

	1958 (nine months)	1957 (nine months)
Oil	1,115	1,482
Gas	174	146
Dry	615	650
Totals	1,904	2,278

By provinces, the well completions in the first nine months were:

	1958	1957
Alberta	1,202	1,082
Saskatchewan	559	936
Manitoba	71	189
Northwest Territories	7	3
British Columbia	65	68
Totals	1,904	2,278

WELLS BY PROVINCE

	1958 (nine months)	1957 (nine months)
Alberta		
Oil	682	694
Gas	138	100
Dry	382	288
Total	1,202	1,082
Saskatchewan		
Oil	372	666
Gas	16	10
Dry	171	260
Total	559	1,036
Manitoba		
Oil	50	114
Dry	21	75
Total	71	189
British Columbia		
Oil	11	8
Gas	20	36
Dry	34	24
Total	65	68
Northwest Territories		
Dry	7	3
GRAND TOTALS	1,904	2,278

G. R. Henderson

C. A. Foster

Henderson President Catalytic

Gordon R. Henderson has been elected president and director of Catalytic Construction of Canada Ltd. Catalytic is an engineering and construction organization in the oil-refining and chemical fields, with headquarters in Sarnia. In 1932, he joined Shell of Canada at its Montreal refinery. In 1940, he was placed in charge of construction of an $18 million refinery in Heysham-Lancashire, England, and later became chief engineer of that refinery.

Mr. Henderson has been with Polymer Corp., and in 1951 was appointed general manager of Catalytic's Canadian activities.

Berland River Gas Find

Unofficial estimates by British American Oil engineers place gas reserve of initial Berland River discovery well at approximately 2 trillion cubic feet (2 mmmmcf) regardless of possible extensions. Second well being drilled 3½ miles northwest, along indicated trend, will increase estimated reserves to 5 trillion if it is as good as the first well. The second well is scheduled for completion about March 1959.

More BP Outlets

Nine retail gasoline outlets formerly operated in the Toronto area by Atlas Oil have been bought by BP Canada, a subsidiary of British Petroleum Co., London. Under this expansion program, the company reportedly is buying three to four stations a week in Ontario. BP now has 400 outlets in Quebec.

British Columbia Oil Statement

Possible tough attitude towards local oil development may have been indicated, perhaps inadvertently, by Hon. Lyle Wicks, British Columbia labor minister, in an address at opening of B-A Port Moody refinery, when he said that Vancouver area refineries should be supplied with British Columbia crude through pipeline from Peace River area. Entire supply at present is from Alberta through Trans Mountain pipeline which is running at only 30% capacity.

Canadian Crude Exports

Crude-oil export market in northern states continues firm, with Great Northern Oil Purchasing Co. nomination for October set at 57,607 b/d from Manitoba and Saskatchewan, up from 47,352 b/d in October 1957. Alberta market is down about 4,000 b/d, leaving net increase of more than 6,000 b/d.

Personals

CHARLES HAY has been appointed president of Royalite Oil Co. Ltd., by the integrated independent along with three other top appointments. Hay formerly was executive vice president of the company. The presidency had been vacated earlier this year by resignation of **RAY ALTHOUSE. J. W. WHITAKER** and **D. J. MORRISSON,** have been appointed secretary and treasurer. The post of secretary-treasurer formerly was held by **K. S. C. MULHALL.** Roland L. Thompson, operations manager, was named a director to fill a vacancy created by the retirement of C. U. Daniels. The company's newly appointed president also serves as president of these companies: Royalite Hi-Way Ltd., Saskatoon Pipe Line Co. Ltd., Mid-Saskatchewan Pipe Lines Ltd., Bituminous Oil Pipeline Ltd., all subsidiaries of Royalite, Producers Pipelines Ltd., and Westspur Pipe Line Co.

JOHN W. UIBEL, of Calgary, has been promoted from district engineer to chief engineer of Central-Del Rio Oils Ltd. He was employed as a field engineer by Central Leduc Oils Ltd. in 1953. In 1956 he was appointed district engineer, and in 1957 was transferred to the head office of Central-Del Rio Oils Ltd. in Calgary.

KENT STODDARD of Weyburn, Sask., has been appointed from field engineer to district engineer for Central-Del Rio Oils Ltd. He joined the company as a field engineer at Weyburn, and as a development engineer for Central's rapidly expanding operations in Saskatchewan and North Dakota.

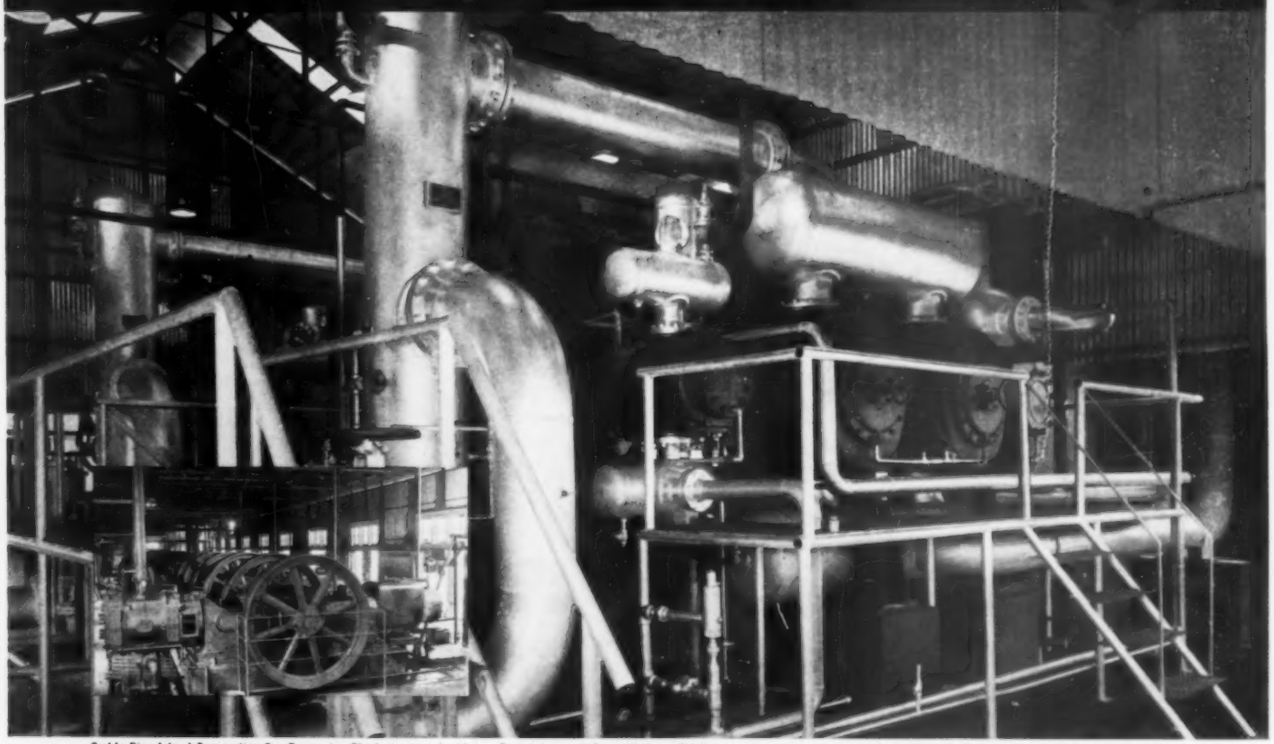
C. A. FOSTER, Jr., has been appointed vice president, marketing, for Shell Oil Co. of Canada Ltd. He succeeds A. L. Wilson who has been chosen to carry out a special assignment reporting directly to the president.

B. F. WILLSON has been appointed executive vice president of Canadian Western Natural Gas Co. Ltd., Calgary, and of Northwestern Utilities Ltd. A director of both companies, Mr. Willson also serves as a director of Alberta Gas Trunk Line Co. Ltd., and The Canadian Gas Assoc.

S. P. KENT has been elected as vice president and manager of operations of Paria Operations Inc., with headquarters in Caracas, Venezuela. For the past six years Mr. Kent was superintendent of drilling and production for Texaco Exploration Co., a wholly owned Canadian subsidiary of The Texas Co.

BEAIRD-INGERSOLL-RAND Packaged Compressor Plant

Lowest Cost Per Horsepower Installed



Caddo Pine Island Corporation Gas Processing Plant—equipped with two Beaird-Ingersoll-Rand 660 h.p. 12SVG packaged compressors. Units have Young Radiators with gas, lubricating oil and engine water cooling sections. Other sizes 120 to 660 h.p. Inset picture shows original horizontal compressors.

Two Packaged Compressors

DO WORK OF TWENTY OLDER UNITS

Caddo Pine Island Corporation processes flare gas from 1,000 Pine Island Field wells in an absorption plant located near Oil City, Louisiana. Picking its load up over a thirty mile gathering system, the plant was originally equipped with twenty horizontal compressor units. These have now been replaced by two Beaird-Ingersoll-Rand 12SVG 660 h. p. packaged compressors.

Using three stages of compression the packaged units pull the gas into the plant under ten inches of vacuum. It is then boosted through processing operations and returned for third stage boosting to the sales line. Up to 5¼ million cubic feet can be handled per day with final delivery pressures of 440 psi.

Installation of modern Beaird packaged compressors has increased plant dependability and lowered fuel, labor and maintenance costs. An additional savings will be realized when the field is depleted. Installation of packaged compressors has made the station almost wholly salvable.

Let Beaird engineers help you find an economical solution to your plant expansion or modernization program.

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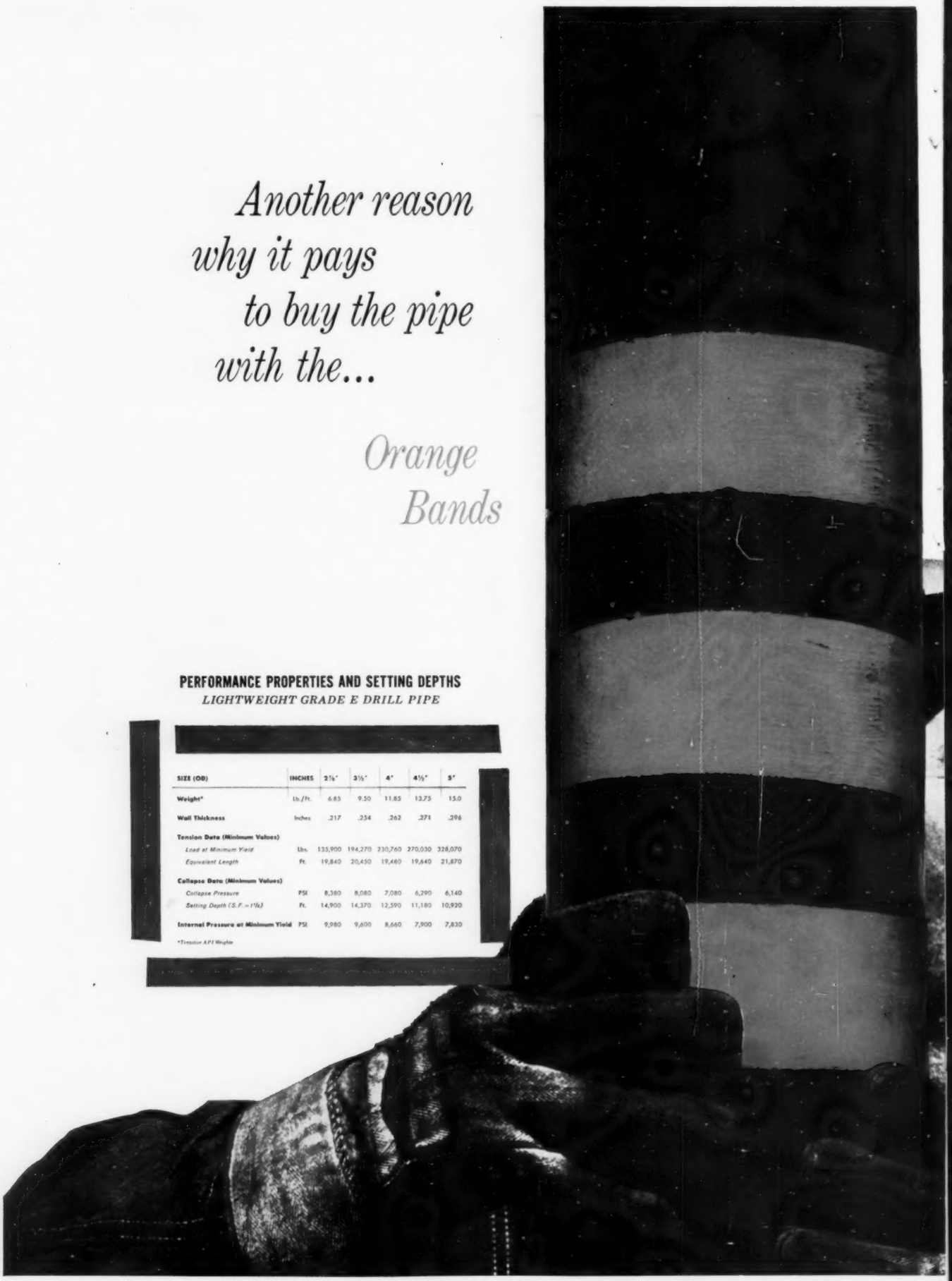
Orange Bands



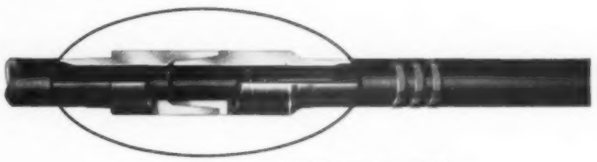
PERFORMANCE PROPERTIES AND SETTING DEPTHS

LIGHTWEIGHT GRADE E DRILL PIPE

SIZE (OD)	INCHES	2⅞"	3½"	4"	4½"	5"
Weight*	lb./ft.	6.85	9.50	11.85	13.75	15.0
Wall Thickness	Inches	.217	.254	.262	.271	.296
Tension Data (Minimum Values)						
Load at Minimum Yield	Lbs.	135,900	194,270	230,760	270,030	326,070
Equivalent Length	Ft.	19,840	20,450	19,480	19,640	21,870
Collapse Data (Minimum Values)						
Collapse Pressure	PSI	8,380	8,080	7,080	6,290	6,140
Setting Depth (S.F. = 1⅛)	Ft.	14,900	14,370	12,590	11,180	10,920
Internal Pressure at Minimum Yield	PSI	9,980	9,600	8,660	7,900	7,830

*Tentative API Weights

YOUNGSTOWN LIGHTWEIGHT DRILL PIPE



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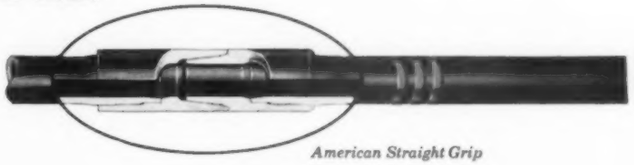
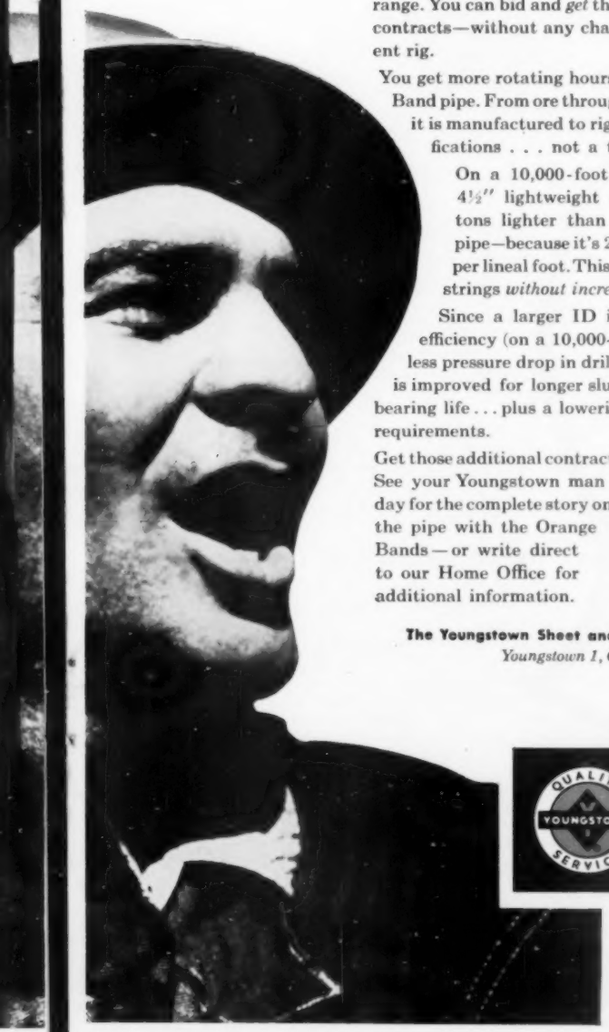


American Straight Grip

Welded

Reed Super Shrink-Grip "Wide Open"

Hughes Seal Grip



Now, Youngstown provides a lightweight drill pipe that will substantially extend your bidding range. You can bid and *get* those deeper drilling contracts—without any changes in your present rig.

You get more rotating hours with this Orange Band pipe. From ore through final inspection, it is manufactured to rigid drill pipe specifications . . . not a tubing substitute.

On a 10,000-foot hole, a string of 4½" lightweight drill pipe is 14¼ tons lighter than 4½" regular drill pipe—because it's 2.85 pounds lighter per lineal foot. This means longer drill strings *without increased weight.*

Since a larger ID is used, hydraulic efficiency (on a 10,000-foot string, 16.7% less pressure drop in drilling fluid column) is improved for longer slush pump rod and bearing life . . . plus a lowering of horsepower requirements.

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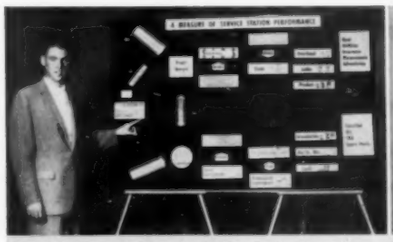
DU PONT *Petroleum Chemicals* NEWS

Number 93 in a Series of Bulletins for the Petroleum Industry

DECEMBER 1958

Three oil industry presentations by DuPont win first-place awards for effectiveness



"A Measure of Service Station Performance"

"What Every Woman Should Know About Her Car"

"Dollars and Sense"

TOPS FOR TRAINING: Du Pont presentations for the oil industry which won first prizes in 1958 visual aids competition

Three training presentations widely used in the petroleum industry have won first-place awards in the 1958 visual aids contest of the National Visual Presentation Association.

Created as part of the Du Pont sales and service program for refiners and marketers, these prize-winning presentations topped all others in three of the six categories in the Graphics competition.

All three prize-winning programs are available to oil companies for dealer orientation, service station training, or good-will showings to groups of consumers.

"*A Measure of Service Station Performance*" won first place in the "Employee Training" category.

It is a flannelboard presentation created to simplify and explain the economic factors which realistically measure the success of a dealer in terms of "per cent return on investment." It can be given as a three-hour discussion program, or as two 1½-hour sessions, or in short form as a 30-minute lecture. The longer versions include the use of a worksheet which helps each member of the audience to measure his own performance.

"*What Every Woman Should Know About Her Car*" took first-place honors in the "Public Relations – Education" class.

This "flackboard" (flannelboard and blackboard combined) presentation was created to increase greatly the public's confidence in their service station operators. It explains in simple terms the mechanical features of the modern automobile, and tells how women can keep their cars operating dependably with the help of their dealers' knowledge. It tells what must be attended to—why—and when, and convincingly shows that the cost of this regular maintenance is much lower than various types of insurance – only about 7/10¢ per mile.

"*Dollars and Sense*" is a flannelboard presentation which explains the everyday problems of all businesses – large and small. It won first prize in the "Employee Relations" category.

Oil helps make Christmas merrier for millions

Many of oil's chemical offspring will play a big part in making Christmas a happy occasion around the world this year.

Nylon, for example, will find its way under millions of Christmas trees – as molded parts in *Junior's train*, in *Dad's power tools*, and in an infinite variety of garments from *stretch socks* to *dolls' clothes*.

"Dacron" polyester fiber, another product made partly from oil, will turn up in everything from *shirts* to *slacks*, *loungewear* to *lingerie*.

And many, many more products derived from oil will contribute to happiness at Christmas this year.

These products are the results of constant experimentation and research, with oil and its derivatives. At Du Pont, chemistry helps turn oil into exciting new products. This spells an ever increasing demand for petroleum in the years to come.

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OVER

DU PONT *Petroleum Chemicals* NEWS

You ought to know...

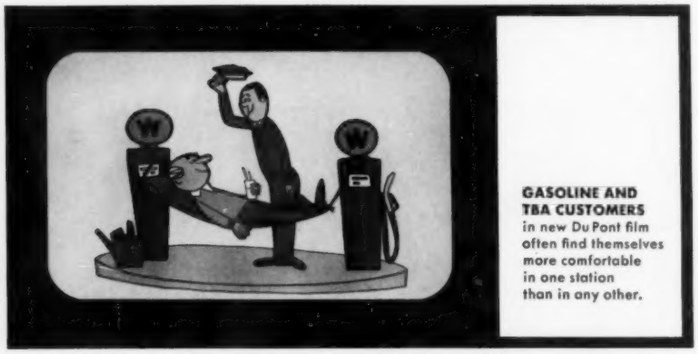
FENTON RUSSELL, M.D., has, by his own admission, "not discovered anything and has invented nothing."

Yet as a member of Du Pont's Medical Division, Dr. Russell plays a role that is of importance to every refiner who uses tetraethyl lead. Travelling distances which would amaze the busy circuit-riding doctor of the past, he works closely with refinery managements, physicians, supervisors and blenders to help them maintain the very finest health and hygiene programs.

Dr. Russell also participates in many of the Du Pont Training Programs conducted in refineries, to teach safe and proper methods of unloading and blending tetraethyl lead.

He joined the Du Pont Company in 1943 and participated in the wartime Manhattan Project at Hanford, Washington. Later he moved to the Du Pont Medical Division to pursue his special interests, Legal Medicine and Toxicology. Dr. Russell received both his B.S. and M.D. degrees from the University of Pittsburgh.

His friends know that he "loves to make a speech" – which should lend encouragement to refiners who might want to use the services of Dr. Russell to augment their own safety training programs.



GASOLINE AND TBA CUSTOMERS in new Du Pont film often find themselves more comfortable in one station than in any other.

"Know your customer" motion picture helps dealers use psychology in selling

"Gee . . . he picked my station!" enthuses the typical service station operator, in Du Pont's new full-color semi-animated strip-film.

Then he learns *why* his customers choose him . . . what makes a customer tick. The information in this 10 minute presentation is based on the nationwide survey of service station patrons which was conducted for Du Pont by psychologists from National Analysts, Inc.

In the survey–and in this screenplay – the *real* reasons for station selection are revealed. For example, the patron who drives past station after station across a city to go to his favorite dealer's because it is "convenient" is actually motivated by his feeling that this particular dealer is really interested in him and his car.

And the woman who goes to a station "because it is convenient" often has an even deeper reason – in some service stations she is treated with patience and helpfulness, not being made to feel uncomfortable in a strange man's world of mechanical mysteries.

This sound film, with its likeable characters and sprightly action, carries its message simply, with force and good humor. It is ideal for dealer-orientation meetings, for which it is readily available. Simply contact your Du Pont representative and he will arrange showings for you.

CONTINUED **First Place Awards**

Purpose of this visual aid is to help improve relationships between oil companies and dealers, by helping dealers to understand our free enterprise system in the light of problems shared by business of all sizes, with some predictions about the future of the service station business.

Kits for these presentations are available, complete with detailed scripts. Any speaker can use them with a minimum of preparation.

For further information about these –or the more than 30 other sales services we offer–write to Petroleum Chemicals Division of the Du Pont Company.

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Cleveland 15–101 Prospect Ave. . . . . MAin 1-3422
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Los Angeles 17–612 So. Flower St. . MAdison 4-1354
New York 20–45 Rockefeller Plaza . . . . . COlumbus 5-2342
Philadelphia 2–3 Penn Center Plaza . LOcust 8-3531
Pittsburgh 22–1 Gateway Center . . . ATlantic 1-2933
San Francisco 4–111 Sutter St. . . . . EXbrook 2-1934
Seattle 3–4003 Aurora Ave. . . . . MElrose 2-6977
Tulsa 1–1811 So. Baltimore Ave. . . . . LUther 5-5578
In Canada–Du Pont Company of Canada (1956) Limited, Petroleum Chemicals, 85 Eglinton Ave. East, **Toronto 12**–Ontario . . . . . HUdson 1-6461
In Other Countries–Organic Chemicals Department, Export Division, 7447 Nemours Bldg., Wilmington 98, Del., PRospect 4-2962.

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. . . through Chemistry

Du Pont Tetraethyl Lead and other Petroleum Additives

OVER

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PART OF EVERY DOLLAR you invest in Hughes rock bits and tool joints goes into research. *And it comes back to you in improved products* that help you get holes down faster and at lower cost.

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stretches your drillstem dollars

Before ordering your new drillstem, let Hughes show you how the latest development in "Flash-Weld" tool joints can make your drillstem dollars go further.

Profit by Hughes' 20 years of flash-welding experience!

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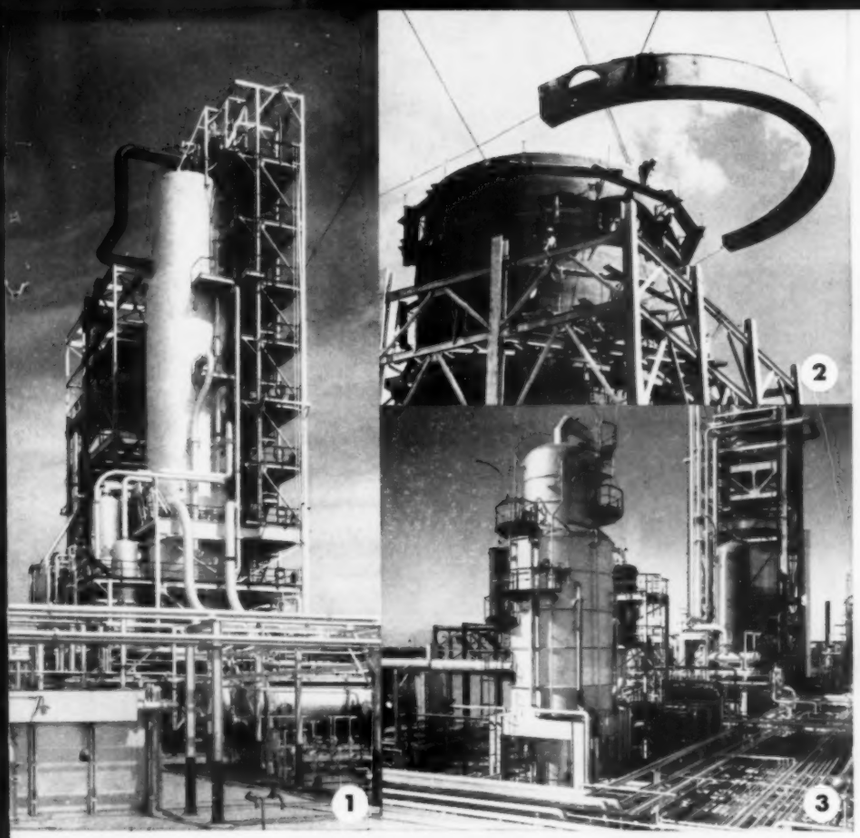
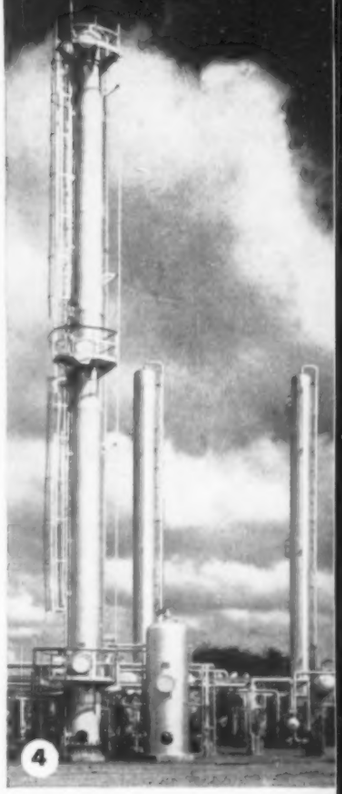


1. 9-ft. diam., 116-ft. high fractionating tower built for Creole Petroleum Corp. Ltd. at Amuay Bay in Venezuela.

2. Air duct section for *first* type TCC Thermofor unit built, is raised at Capuava Refinery in Sao Paulo, *Brazil.*

3. 63-ft. high vacuum column partially clad with 405 stainless steel built by CB&I for Petroleo Mexicanos Minatitlan refinery.

4. Gasoline stabilizer, high and low pressure absorbers and oil still—just a few of the extensive CB&I-built equipment erected for Phillips Oil Company at San Roque, *Venezuela.*



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P66CB

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PRODUCT	APPLICATION
UOP NO. 1* Inhibitor, a phenolic fraction obtained from wood distillation.	Most economical way of obtaining antioxidant units.
UOP NO. 4* Inhibitor, a substituted aminophenol.	Protects unstable gasolines; potent for reducing copper dish gum.
UOP NO. 5* Inhibitor, N, N'-di-secondary butyl-p-phenylene-diamine.	Prevents gum formation and stabilizes tetraethyl lead; catalyzes air oxidation of mercaptans.
UOP NO. 5S* Inhibitor, phenylene-diamine type antioxidant.	Similar to No. 5 but catalyzes sweetening at a sharply increased rate.
UOP NO. 7* Inhibitor, crystalline dibutyl para cresol.	Inhibitor for relatively stable gasolines; stabilizes lead, insoluble in acid or alkaline tank bottoms.
UOP NO. S-7* a 33⅓% solution of UOP No. 7 in toluene.	Improved convenient form of No. 7 for liquid injection into gasoline.
COPPER DEACTIVATORS Regular Grade—80% active ingredient. AW* (50) Grade—50% active ingredient.	Prevents traces of copper from interfering with the action of the above inhibitors. Synergist for fuel oil inhibitors and dispersants.
UNICOR® ash-free, low nitrogen, oil-soluble corrosion inhibitor.	Protects refinery equipment, storage tanks and pipe lines from corrosion. Active over wide pH range.
UNICOR® LHS anti-icer and corrosion inhibitor.	When added to gasoline it eliminates stalling caused by carburetor ice. An excellent corrosion inhibitor for all distillate streams; particularly useful in liquid propane and butane.
POLYFLO* 100 an all-organic inhibitor-dispersant.	For all fuels and diesel oils: 1) To improve jet fuel thermal stability. 2) To stabilize No. 2 heating oils and diesel fuels against color deterioration and sludge deposition. 3) To eliminate fouling in feed exchangers and reboilers. 4) To eliminate tank bottoms in crude and residual oil storage tanks.

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*Trade Mark

UNIVERSAL OIL PRODUCTS COMPANY
30 Algonquin Road, Des Plaines, Illinois, U.S.A.

Heating Straight Grip tool joints in American Iron's self-contained portable furnace, at field-installation.

How American Iron "Straight Grip" tool joints increase your drill string efficiency!

In those areas where tool joints must be replaced before the drill pipe is retired or where tool joints outlast the drill pipe, American Iron hand-applied Straight Grip tool joints are your best investment.

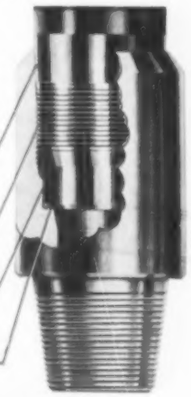
The most advanced design in a tool joint, the Straight Grip offers FOUR-POINT SEAL protection against joint leakage and creep . . . seals actually become tighter as pump pressures increase. When replacements are necessary, the job is done quickly, efficiently right at your rig.

Features that make Straight Grip your best tool joint buy:

- FOUR points of fluid seal!
- Tighter seal as tension load and pump pressure increases!
- Three times as strong as the pipe they connect!
- Positive protection against joint leakage!
- Require no selective fitting to drill pipe!
- Quickly, easily removed and installed at your location!

Straight Grip—the hand-applied tool joint with exclusive

4-POINT SEAL PROTECTION



Only Straight Grip Tool Joints are capable of handling high tensile drill pipe!

Send for free brochure entitled "Principles of American Iron Straight Grip Tool Joints" and see why Straight Grip is your only practical hand-applied tool joint in operation today!

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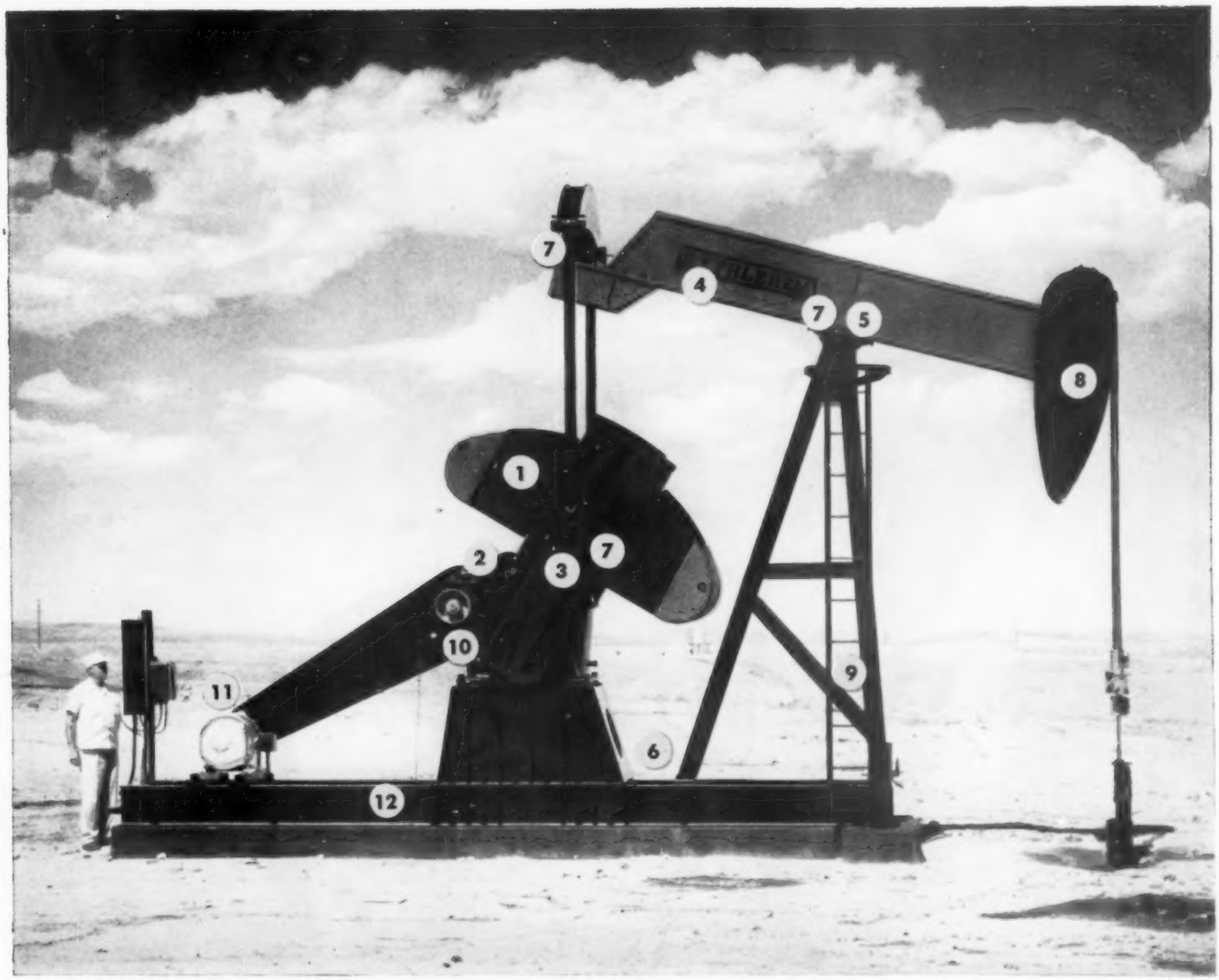

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Bethlehem pumping units are available in every size and type ever needed in oil-field production work. They range in capacity from 6,000 to 640,000 in.-lb torque; will handle polished-rod loads from 2,000 to 33,000 lb. Strokes range from 16 to a maximum of 168 in.

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4. Step-down walking beam providing equal torque loading in either direction.
5. Saddle bearing—one-piece type to prevent misalignment. Centralized or ground lubrication system.
6. All structural members shot-blasted and primed to obtain maximum paint durability.
7. Relief valves at all pressure-lubricated points.
8. Arc-type removable horsehead. Supports wire lines and carrier bar.
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11. Prime mover as specified by customer: electric motor, medium-speed horizontal engine, high-speed multi-cylinder engine.
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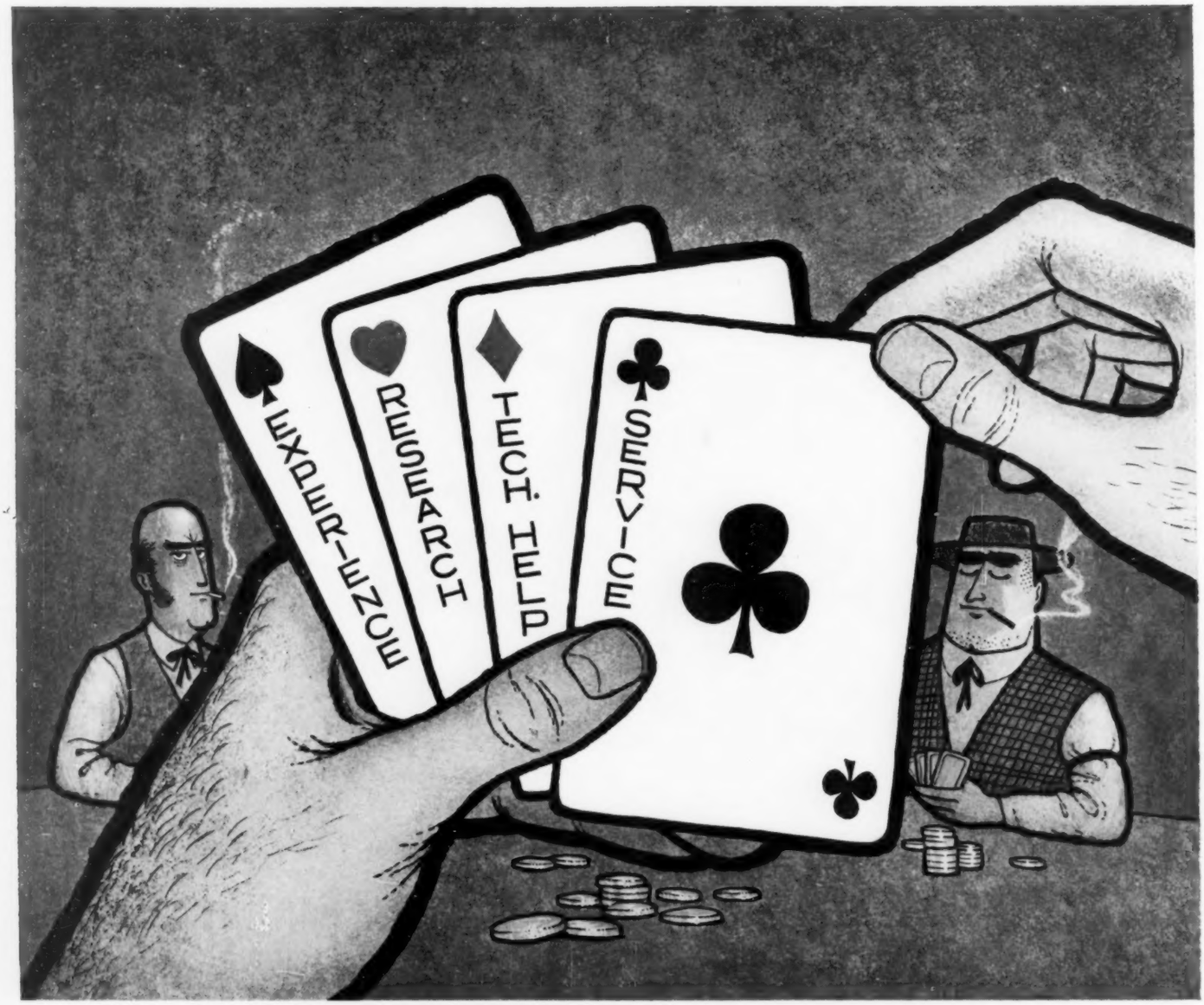
BETHLEHEM SUPPLY

BETHLEHEM STEEL



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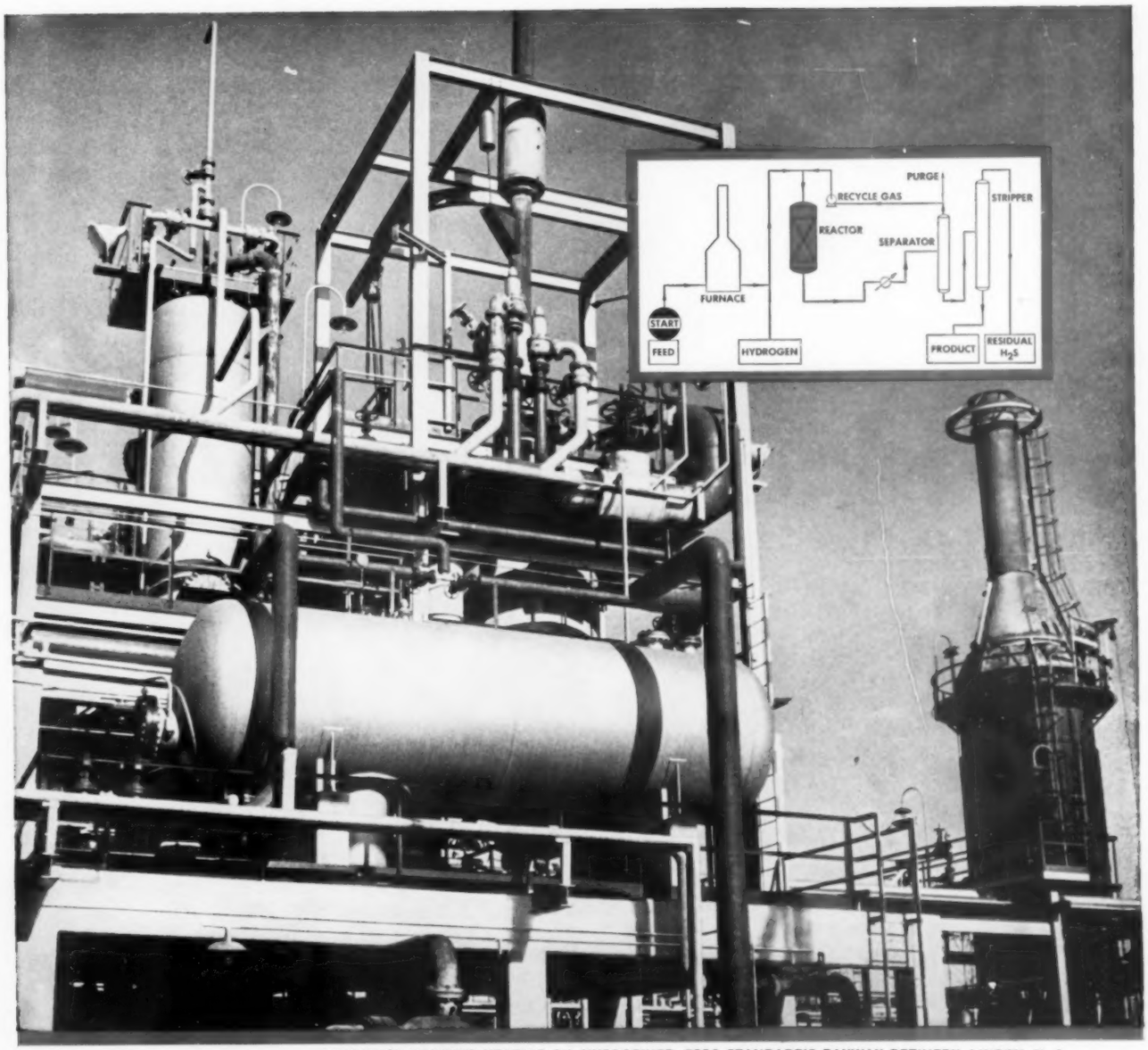

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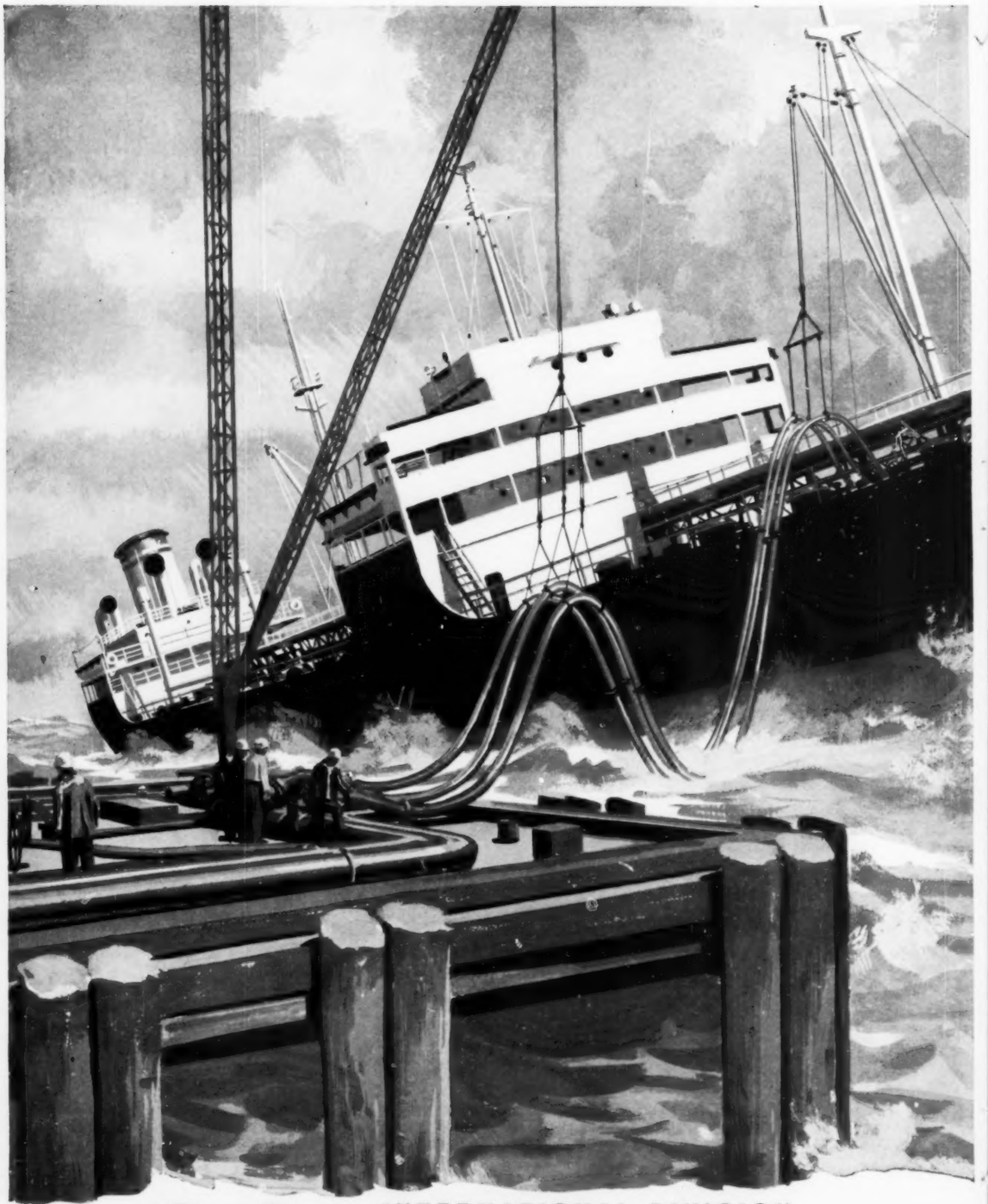

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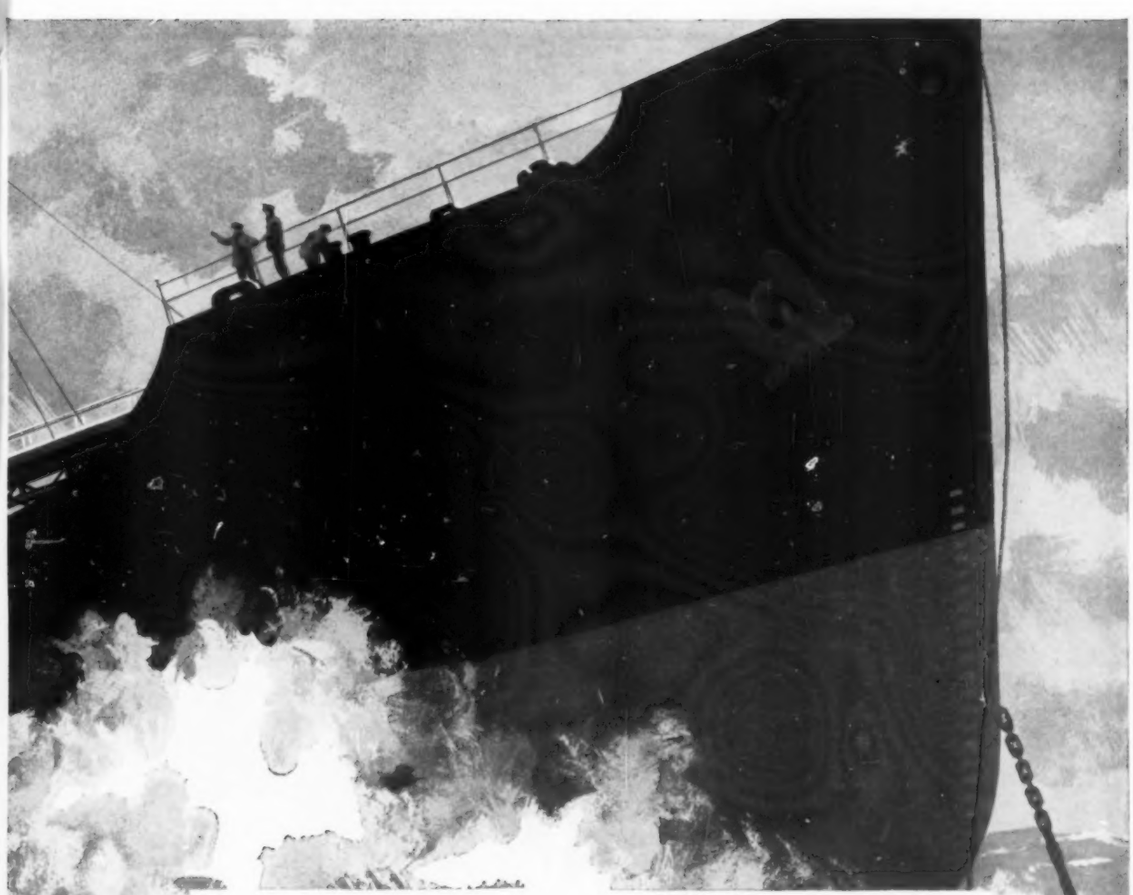

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This tanker must be loaded half a mile at sea without protective harbor or breakwater. When heavy seas are running, she must be moored 75 to 100 feet from the dock. The hose bridging the gap was failing prematurely, until Hewitt-Robins hose was installed. Service records now show more barrels per length of "Monarch" hose than ever before.

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P.141R

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PC-57-I

Special Big Tops for Caustics, Open Tops for Brine

. . . part of major expansion at Port Neches, Tex. petrochemical plant at Jefferson Chemical. . . . special Graver cone roof design eliminates corrosion maintenance problems.

Conventional cone roof construction would not do for the two largest tanks above. Interior roof structurals could not be protected against corrosion from the 50% caustic to be stored. And so Graver designed the roof structurals on the outside, leaving the interior smooth for easy application of a corrosion-resistant coating.

Three tanks of this special design were built by Graver to answer the corrosion problem at Jefferson Chemical under order from Singmaster & Breyer, Inc., New York, Designers and The Fluor Corporation, Ltd., Los Angeles, Constructors. Also fabricated and erected by Graver were the eight open-top tanks above, used for slurries of raw and treated brine, for treating brine for cell liquor storage, as well as seven smaller open-top tanks and two solid nickel tanks.

GRAVER TANK & MFG. CO., INC.
EAST CHICAGO, IND.

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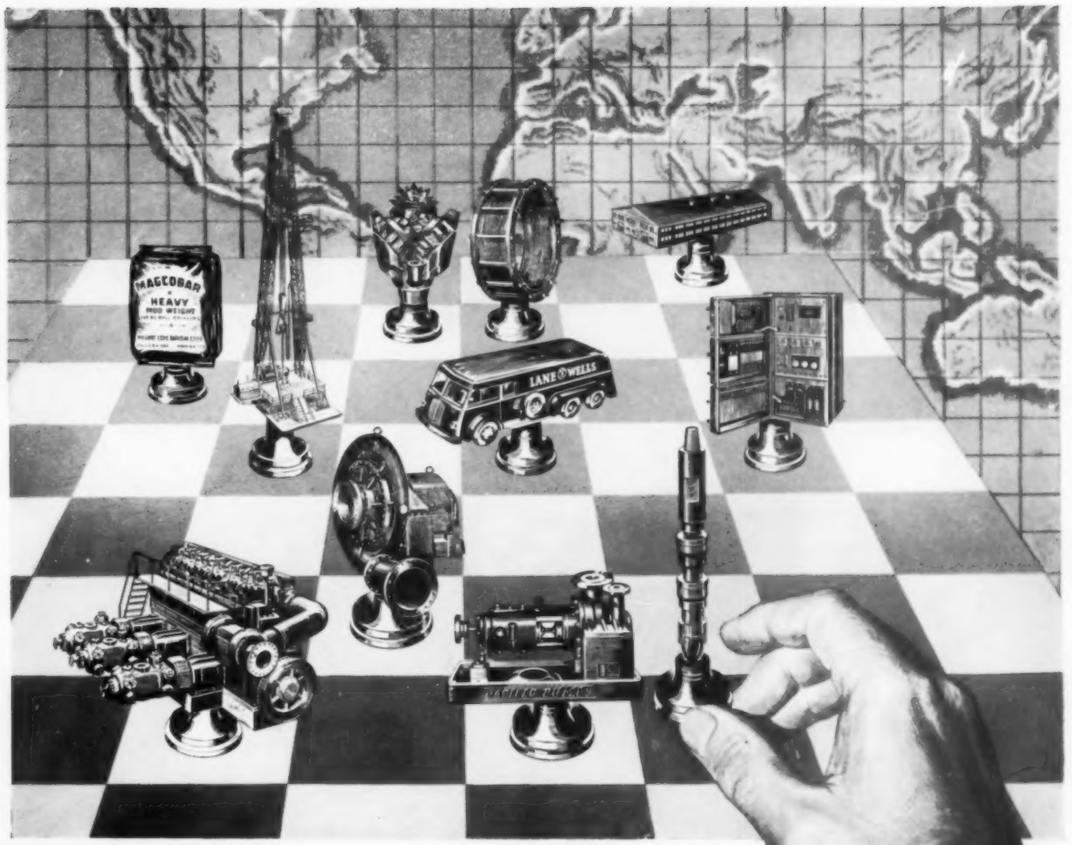

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Petroleum, priceless ingredient of energy as well as boundless by-products, plays a universal game of hide and seek with the world's oil men. Wherever the ground justifies the gamble, Dresser representatives are on hand to provide specialized equipment and technical services that encourage success. These men of Dresser are identified by many corporate names...for Dresser Industries, Inc. is a group of specialized companies each of which operates independently to better serve your needs. Though representing any one of eleven operating units, Dresser men are prepared to put at your service the famed Dresser *plus* ✚ . This *extra* value results from the coordinated performance of all Dresser companies—combining global experience, engineering talent and diversified manufacturing facilities in many countries. Throughout the oil, gas, chemical and other industries the Dresser *plus* ✚ is your assurance of superior equipment and technical services—the standard of comparison the world over.

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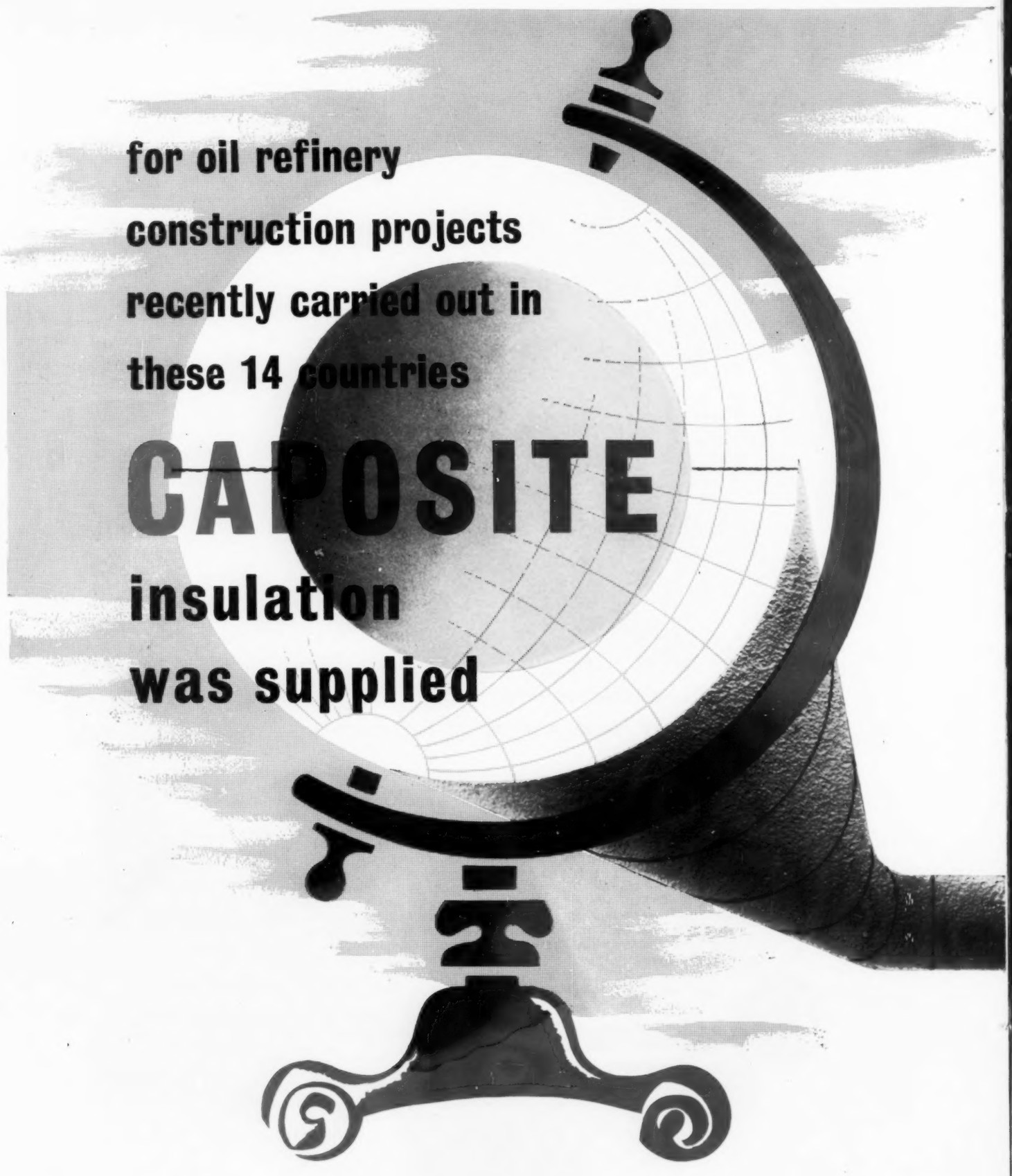
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construction projects
recently carried out in
these 14 countries
CAPOSITE
insulation
was supplied

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for Bahrain Petroleum Co. Ltd. Main Contractor: Foster Wheeler Ltd.

BURMA *at Syriam*
for The Burma Oil Co. (1954) Ltd. Main Contractor: Foster Wheeler Ltd. (London)

CANADA *at Clarkson, Ontario*
for British American Oil Co. Ltd. Main Contractor: The Lummus Co.

COLOMBIA *at Cartagena*
for International Petroleum Co. Ltd. Main Contractor: Bechtel Corporation (Insulation Contractor: Harold Aber & Co.)

ECUADOR *at La Libertad*
for the Anglo-Ecuadorian Oil Co. Ltd. Main Contractor: Procon (G. B.) Ltd.

ENGLAND *at Kent Oil Refinery*
for The British Petroleum Co. Ltd.

FRANCE *at Raffinerie de Normandie*
for Compagnie Francais de Raffinage. Main Contractors: Kellogg International Corporation and Foster Wheeler Ltd. (France). (Insulation Contractor: Soc: Technisol).

IRAQ *at Daura, near Baghdad*
for Iraq Government Oil Refinery Administration. Main Contractor: Foster Wheeler Ltd. (London).

ITALY *at Genoa*
for Raffineria Dottore E. Garrone. Main Contractor: C. T. I. P.

KUWAIT *at Akmadi*
for the Kuwait Oil Co. Ltd. Main Contractor: Bechtel-Wimpey and E. B. Badger & Sons Ltd.

THE NETHERLANDS *at Pernis*
for N. V. de Bataafsche Petroleum Maatschappij.

NETHERLANDS ANTILLES *at C.P.I.M. Refinery, Curacao*
for Royal Dutch-Shell Group.

SCOTLAND *at Grangemouth*
for British Hydrocarbon Chemical Co. Ltd. Main Contractor: E. B. Badger & Sons Ltd.

VENEZUELA *at Maracaibo*
for The Richmond Exploration Co. Main Contractor: The Lummus Co.

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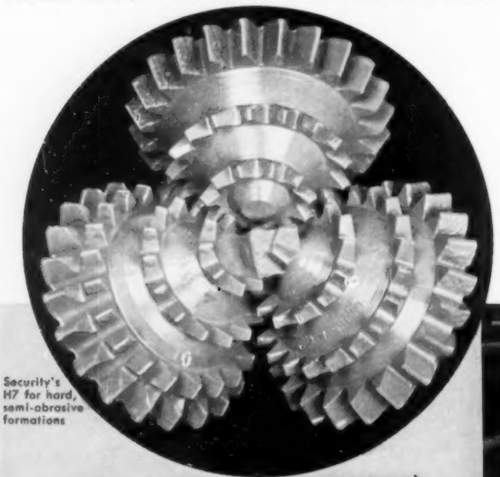

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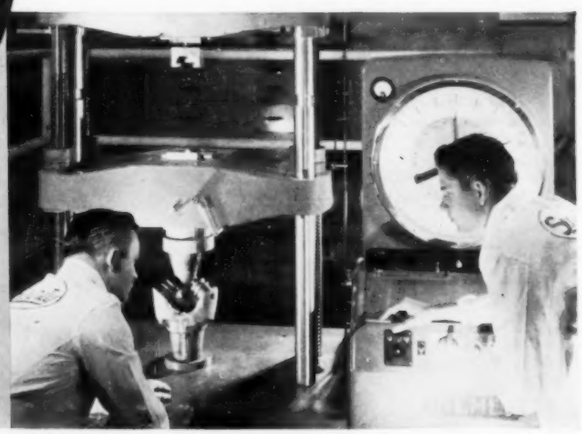

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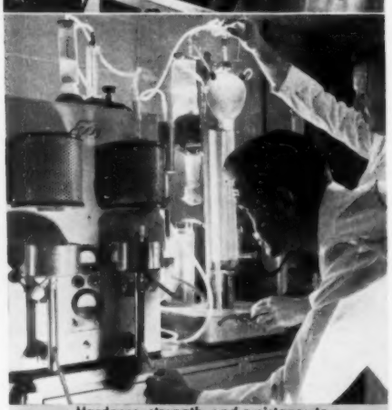

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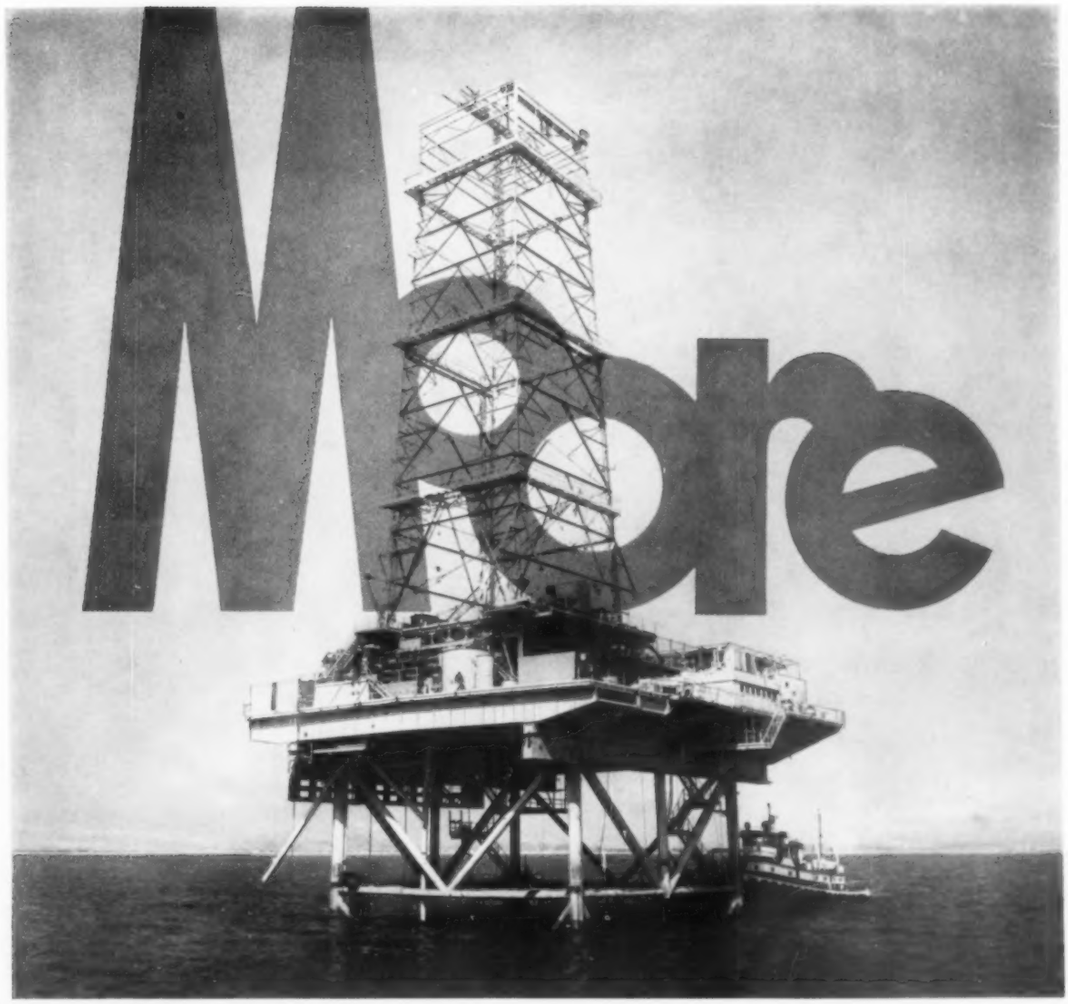

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Argentina's Welcome Mat Is Out Again

FOUR years ago Argentina was seriously considering a number of deals with foreign oil companies in order to stop the serious drain on the nation's foreign exchange made necessary by the deficiency in domestic sources of energy. At that time, Argentina's bill for imported oil was roughly $100 million per year. Population was 17,600,000, so that the currency drain was more than $5 per person per year.

At that particular time, Standard Oil Co. of California was offering to spend a minimum of $13.5 million for preliminary reconnaissance and wildcatting on a proposed concession. Had the preliminary work proved encouraging, Socal was prepared to spend many times the sum mentioned for intensive development. Shell and Esso also expressed a willingness to make very large investments in an effort to find more oil. Both had small operations in Argentina but had been prevented from expansion when their early concessions had been fully drilled.

Political developments in Argentina prevented ratification of the Socal exploration permit, and negotiations with Esso and Shell were dropped. It became national policy to place the burden of responsibility on the government's company, YPF, to develop adequate supplies of oil to meet domestic needs.

Within the limits of the money made available by the government, the YPF has tried diligently to close the gap between available supplies of oil and domestic demand. But in the four years since the burden was put on the State company, the volume and total cost of imported oil have risen steadily.

Most geologists believe Argentina is blessed with great undiscovered oil reserves. The land area of the nation is about 1,235,000 square miles, of which more than half is believed to be worth investigation for oil. In addition, the continental shelf within the possible reach of the drill extends eastward from the shoreline as far as 300 miles at some points. Development work to date has shown that petroliferous sediment are present onshore. If Argentina pursues its new policy, there seems no reason to doubt that private capital will find adequate supplies of oil. This, of course, raises a fundamental question as to why YPF with its near monopoly hasn't got the job done. Money is, of course, one factor—and YPF has never had enough.

The monetary risk of hunting for oil is great. The amount of money is astonishingly large, which often must be invested before oil is found in paying quantities. The Texas Co. recently announced its operations in Colombia had reached a profitable stage. But before any profit was made the company had invested $60 millions and many frustrating years. The government of Colombia took no risks. Its economy was aided during the years of search by the money spent by Texaco for wages and supplies.

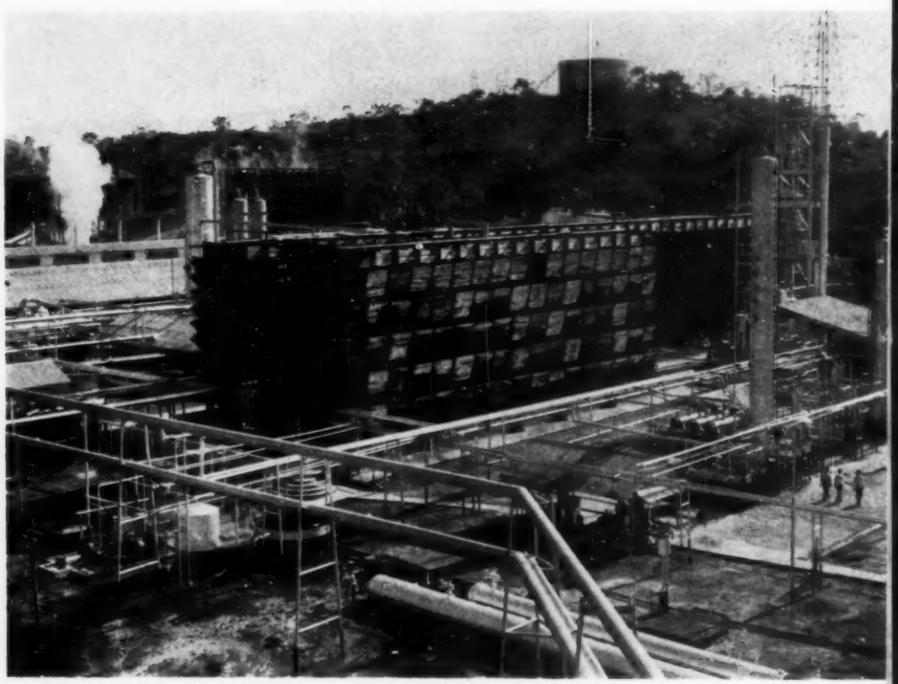
In the Republic of Cuba, production of crude oil is only about 1,000 b/d—this in spite of the fact that dozens of companies have poured millions of dollars into a search for oil on the island and in its territorial waters. This search has cost Cuba nothing. On the contrary, its prosperity is greater than before.

There are a number of other factors which usually are not given adequate weight by nationalists when considering public versus private operations. Perhaps the most important of these is competition. In a competitive society, it becomes necessary for the individual or the corporation to be skilled in technical operations and efficient in the employment of men and materials. The unskilled and the inefficient fail. The government company has no competitor. It can't go bankrupt. When a business is operated by the government, it is rare that individual skills and efficiency are as great as in a competitive race. When working for a government, it usually is better and safer not to take too many chances, drill too many wildcats, or adopt too many new techniques which are not tried and true over many years. One has to be satisfied with a lower rate of pay on a government job, so why hurry or improve? Why be daring? In any case, the red tape would delay or kill off most projects.

When oil is found under private operations, the government is rewarded in many directions. When imports of energy are stopped, the drain on foreign exchange is minimized. Currency is stabilized. Earnings of the people can be used for other useful purposes and to improve living standards. Imported cars need no longer cost fantastic sums. Government income is augmented through royalties and taxes. The whole tempo of business is speeded.

Argentina has tried the "do it yourself" road for many years. The new experiment in contractual relations with foreign investors will be watched with keen interest by such countries as Brazil, which also has a real problem in paying for imported energy. Now, in 1958, private investors have offered to spend a billion dollars to find and produce more oil in Argentina. If these proposals are accepted, it is most likely that the nation will balance its energy budget in a few short years and may, indeed, become an exporter. If the foreign investment climate becomes favorable, there seems to be no reason why true prosperity cannot return to the people of Argentina.

Stabilizer, 7 ft in diameter and 90 ft high, for Colombia fabricated by Dallas Tank Co. (Dallas Tank Co. photo).



View of existing gasoline plant from the West (Ralph M. Parsons photo).

Conflict and promise in Colombia

by E. Ospina-Racines

Greater oil exploratory activity, newcomers, new oil discoveries, secondary recovery, the case for internationalization of oil vs. nationalization, and optimistic operators feature Colombia's oil industry in 1958.

OIL production of Colombia may average some 127,000 b/d in 1958, or just about the same level as in 1957. Oil output is obtained from 23 different oil fields by five operators. The outlook is in favor of increased production in view of the new discoveries being developed. Details of the oil output by fields and operators for a representative month of 1958—August—appear in Table 1.

The data in Table 2 reveal the trend in oil-field development. Colombia's major oil fields are declining normally, as may be seen from the data. The properties which promise increased production in the immediate future include: Colpet's Cicuco; Shell's San Pablo, where the Yarigui field is located; Texas's Palagua-Velásquez and Ermitaño fields, which may prove to be a common oil pool. Note that, with condensate and LPG, Colombia's hydrocarbon output reached 131,993 b/d last August, and is due to increase in 1959. Of the current production, Colombia consumes some 45,000 b/d; and the balance, or some 87,000 b/d, is exported.

The most notable field discovery of recent years in Colombia is the jointly owned Cicuco field of Mobil-Texas, where only 10 wells were completed to the end of August 1958, with an output of 9,601 b/d. Wells No. 11 and 12 are testing, and no doubt will be of the order of 1,500 b/d to 3,000 b/d. Wells Cicuco 8, 9, and 10 tested officially 1,813 b/d, 1,620 b/d, and 3,042 b/d of 43.8 API oil on a ⅜-in. choke and a ½-in. choke for the 3,042 b/d well. The favorable location of this field is indicated on the accompanying map.

The official oil enterprise Empresa Colombiana de Petróleos—Ecopetrol for short—is maintaining its oil output above the 27,000 b/d level. When Ecopetrol took over the De Mares concession in 1951, crude-oil output averaged 36,698 b/d,and for 1957 it averaged 28,447 b/d. During this period Ecopetrol drilled 169 field wells at a cost of $8 million dollars. The 548,291 ft thus drilled averaged $14 per foot. Exploratory drilling by Ecopetrol during 1951-57 has been carried out with 10 wildcats which represent $3.3 million for 60,168 ft, or an average of $55 per foot.

Ecopetrol has farmed out to Cities Service some 2.2 million acres with the agreement of contributing 25% of the exploratory and development outlay and obtaining the same percentage in the oil discovered and produced. The initial results in two wildcats located by Cities Service have been most encouraging. Chucurí 1, south of Barranca and Casabe, was taken down to 10,733 ft into basement; and Peñas Blancas to 7,746 ft was made a pumper with some 400 b/d of 21 API Oil. Shell, which drilled the Peñas Blancas offset well in the Yondo block (see map) brought in a discovery, also having drilled it to 8,195 ft, and completed it for 600 b/d of 31.5 API oil on ¼-in. choke. Cities Service also wildcatted in an old area in Las Monas—now Aguas Claras. The first drilling took place here some 30 years ago, later in the late '30's and in the '40's; and, finally, in 1958 Aguas Claras No. 1 was taken down to 6,716 ft and was brought in for 431 b/d of 29.6 API oil on ⅜-in. choke. The pool will be developed, and No. 2 Aguas Claras is now drilling.

Besides the above exploratory work being carried out by Cities Service-Richfield-Ecopetrol, which will increase the oil output of Ecopetrol, the latter has an agreement with Forest Columbian Corp., the Columbian operator of the Forest Oil Corp. of Bradford, Pa., for the secondary recovery of the Infantas-La Cira fields in the De Mares property. A pilot test has given encouraging results, and a drilling program for water injection is under way. The agreement calls for a 50-50 outlay in the development program, investment, and a split of the secondary oil recovery of 62.5% for Ecopetrol and 37.5% for Forest. The percentage increases for Ecopetrol above a yield of 21,000 bbl per acre, increasing to as high as 80% for Ecopetrol and 20% for Forest. This secondary-recovery program is due to increase Ecopetrol oil output considerably in the near future. Of the 790 million barrels produced to December 31, 1957, in Colombia, the De Mares fields account for 412.6 million produced by the former concessionaire Tropical Oil Co. and 74 million barrels by Ecopetrol from August 26, 1951, to December 31, 1957, or a total of 487 million barrels, 61.5%, of the cumulative total indicated for the country. Data on the oil output by the various operators and fields appear in Table 3. Oil output is due

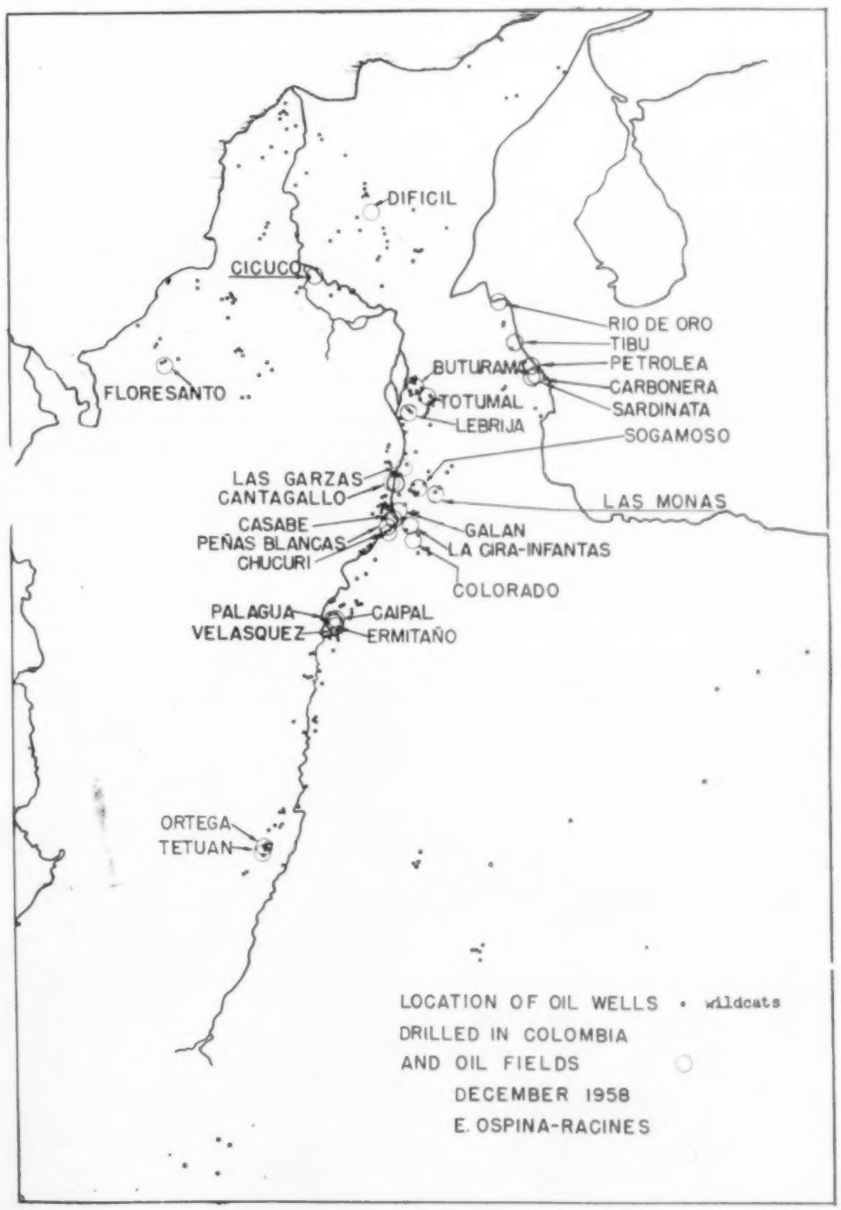


TABLE 1—CRUDE OIL PRODUCTION OF COLOMBIA—AUGUST, 1958—BY FIELDS AND OPERATORS

		FIELD	BARRELS	B/D
1. Empresa Colombiana de Petróleos	ECOPETROL	Infantas	237,739	7,669
		La Cira	528,921	17,062
		Galán	75,510	2,436
		Colorado	18,734	604
			860,904	27,771
		Condensate	60,332	1,946
		LPG	5,665	183
2. Texas Petroleum Co.	TEXAS	Velásquez	689,575	22,244
		Ermitaño	18,099	584
		Ortega	32,774	1,057
		Palagua	226,386	7,303
		Sogamoso	6,076	196
		Tetuán	5,018	162
			977,928	31,546
3. Colombian Petroleum Co.	COLPET	Light	255,178	8,231
		Heavy	522,254	16,847
		Carbonera	1,937	63
		Crude:	799,369	25,141
		Cicuco	297,630	9,601
		TOTAL:	1,076,999	34,741
		Condensate	29,299	945
		LPG	1,280	41
4. Shell Condor S.A.	SHELL	Casabe	762,356	24,592
		Cant'llo	71,614	2,310
		Yariguí	206,913	6,675
		Difícil	30,352	979
			1,071,235	34,556
5. International Petroleum (Colombia)	INTERCOL	Totumal	4,178	135
		Buturama	2,693	87
		Gualanday	1,296	41
			8,167	263
Total Colombia—August, 1958	Crude		3,995,232	128,877
	Condensate		89,621	2,891
	LPG		6,945	224
Total Crude + Condensate + LPG			4,091,798	131,992

to increase by Colpet in Cicuco; Shell in Yariguí and the new discovery Peñas Blancas; Texas Co. in its Velásquez-Palagua-Ermitaño fields in the Upper Magdalena. The location of these fields may be seen on the map.

The current wildcat and field drilling is shown by the data in Table 4. As may be noted, there are 11 oil operators with 10 wildcat and 10 field rigs operating. In contrast, Venezuela has only 19 wildcat rigs running now. The newcomers to Colombia, as may be seen, are: Cities Service or Colcitco; Sun jointly with Pure and United Carbon; Amkirk Petroleo Corp. of Fort Worth, Texas, which holds the 15,000-hectare Floresanto block; and An-Son Petroleum Co. which took over the Lebrija block and has drilled and plans to drill further and develop the Lebrija field; John W. Mecom, independent operator.

Newcomers have displayed much activity. Cities Service signed its joint agreement in February 1957, and in 1958 completed two discoveries. Sun Oil Co. took a farm-out from Mobil-Intercol in mid-year of 1957, and has already completed two wildcats on the Caribbean coast—La Mora 1 in the Sinu area, spudded February 11, 1958, drilled to 8,800 ft, and abandoned on May 18, 1958. The second wildcat, Colomcitos 1, near Cartagena, was spudded June 25 and abandoned at 9,508 ft on September 4, 1958. The third test by Sun, which will be a rank wildcat, will be onshore in the Golfo de Uraba—the most western part of the Colombian Caribbean coast where drilling has not been carried out heretofore. Sun has also filed with the goverment applications for oil concessions totaling 15, covering 549,749 hectares as of June 30 last, as may be seen from the data in Table 5.

Amkirk Petroleo Corp. is ready to spud its Morrocoy 1 in the Floresanto block. An-Son is active both as an operator to prove up the Lebrija block as well as drilling contractor. An-Son drilled in Lebrija. John W. Mecom is due to drill on the coast, near Toluviejo, in a joint operation with Ecopetrol. A new group, called Intercontinental Petroleum Co., with European interests has been organized to acquire oil properties in Colombia. Richmond Petroleum Co., Standard Oil of California affiliate in Colombia, has been drilling in Bolívar and Córdoba, and is carrying out more exploratory drilling. Intercol is wildcatting in the upper Magdalena and drilling stratigraphic tests in the Llanos. Shell and Texas are also wildcatting with success.

Landholding, as of June 30, 1958, appears in detail in Table 5, and may be taken as an indication of the interest there is in the oil prospects of Colombia. As may be seen, these total 28 million hectares in concession and applications for concessions. Firm concessions and properties where drilling can be carried out legally cover 8.9 million hectares, of which 5.2 million hectares are located in western Colombia and 3.7 million in eastern or the Llanos, a vast area some 600 miles from Caribbean tidewater; thence a shipping terminal in Colombia to world markets. The Llanos of Colombia is comparable geologically to the eastern plains of Venezuela which are producing one-third of Venezuela's 2.6 million barrels per day. Leading geologists have expressed a

TABLE 2—CRUDE OIL—CONDENSATE—LPG—PRODUCTION OF COLOMBIA BY FIELDS & OPERATORS

August 1957 to August 1958 By Months—Barrels Per Day

	B/D—CRUDE OIL PRODUCTION OF COLOMBIA + CONDENSATE + LPG + PAST 13 MONTHS BY OPERATORS																	Crude + COND. + LPG.
Month 1957	ECOPETROL Crude	Cond.	COLPET BARCO	COLPET CICUCO	SHELL YONDO	SHELL CT'LLO	SHELL L.G.	SHELL S. PABLO	SHELL DIF.	TEXAS V'QUEZ	TEXAS PALAG.	TEXAS TET.	TEXAS ERMIT.	TEXAS SOG.	INTER. AGA	+ TOT	=	B/D COLOMBIA
Aug.	27,885	2175	25,573	733	30,093	2594		8268	1256	21,430	5583	1016	211		236		=	127,053
Sept.	27,887	2272	25,429	1039	29,754	2374		7820	1222	21,194	5601	1163	285		230		=	126,260
Oct.	28,242	2179	24,593	2381	29,727	2845		7180	1211	21,363	6301	1236	481		402		=	127,861
Nov.	26,664	2075	23,650	4380	29,518	2407		6926	1188	22,335	6788	1076	519		310		=	128,680
Dec.	27,987	2212	24,700	4881	28,561	2398		6791	1126	22,771	7481	1120	491		218		=	130,737
1958:																		
Jan.	28,092	2757	24,339	5565	28,656	2404		6789	1091	22,639	7809	1165	452		217		=	131,975
Feb.	27,897	2601	25,004	6260	27,920	2425	261	5401	1035	21,688	8351	1217	388	171	218		=	130,837
Mar.	28,094	2189	25,928	7049	28,039	2092	242	3175	999	21,766	8205	973	264	266	210		=	129,491
April	27,690	2678	26,508	3916	27,060	2131	158	2921	963	21,012	8376	1172	418	204	211		=	125,547
May	27,661	2239	26,389	7624	26,683	2091	315*	3446	813	20,778	7668	1116	430	194	189		=	127,720**
June	27,536	2213	26,217	6834	25,830	2126	0	4351	863	20,532	7940	1134	522	232	82		=	126,412
July	27,111	2050	26,166+	6225	25,101	2181	0	6061	900	20,246	7950	1177	529	152	226		=	126,077
Aug.	27,771	2129	26,127+	9601	24,592	2310	0	6675	979	22,244	7303	1219	584	196	263		=	131,993

+ Includes 986 B/D of NG & LPG; *Shell Peñas Blancas oil output; **Includes 84 B/D of An-Son Crude

most favorable opinion on the potentialities of the Colombian Llanos; and it is not surprising, therefore, that of the 28 million hectares earmarked for exploration and development 3.7 million are firm concessions and close to 11 million are applications for concessions—i.e., total 14.4 million hectares, or half the total land holdings now.

As may be seen from the accompanying map, some drilling has taken place in the Colombian Llanos—in the lower area: Texas-mid-Llanos-Shell; Intercol in mid- and upper Llanos; the latter are recent stratigraphic tests from around 3,000 ft to 6,000 ft, having reached basement at the lower depths. Oil shows have been obtained in some of the Llanos drilling, but no significant oil pool has been discovered to date. Several geophysical crews, using helicopters, are working the Llanos. One spending $120,000 monthly on this work.

Texas Petroleum Co., which filed the first concession application in the Llanos in 1937, expects to spud a wildcat some time in 1959 in its No. 44 Guavio concession—just due east of Bogotá, some 65 miles. The well site is in a textbook-type anticline structure, and may prove to be a big field. It has to be in order to be commercial at this great distance from tidewater. The consensus of oil economists is that to develop commercial oil in this inland region of Colombia at least one billion barrels of oil must be developed during the 40-year concession period—which means discovering at least twice this volume. Just the pipeline alone would call for at least 100,000 b/d throughput and over a $150 million investment. Texas is now flying road-building machinery to the Llanos to build a 12-mile road to the well site.

As may be seen from the map, drilling has taken place all over Colombia—some 3,200 wells altogether to date. The location of the wildcats is shown by dots, and the fields by circles. A total of 373 wildcats has been drilled in Colombia during 1907-1957, of which 55 were oil; 4 gas; and 314 dry. This exploratory effort of a half-century discovered 41 oil pools, of which 23 proved commercially oil-bearing. Of the 373 wildcats cited, 81 were drilled prior to 1931, and most of them hardly compare with today's wildcat with its modern oil-discovery techniques, greater depths, Schlumberger logs, mud analysis, and completion practices. Total oil discovered to December 31, 1957, in Colombia as a result of the 373 wildcats, with a total of 3,115 wells drilled in the country, is placed at 1.5 billion barrels—of which 790 million barrels have been produced and the balance, or some 710 million barrels, respresent Colombia's oil reserves as of the date mentioned. These data may be compared to Venezuela's experience of 1,250 wildcats, or roughly 3.5 times the 373 wildcats in Colombia since 1907, with oil discovered in Venezuela on the order of 25 billion barrels for the same period—of which some 11 billion barrels have been produced. Some 100 oil fields yield the 2.6 million b/d in Venezuela compared to the 21 fields producing 127,000 b/d in Colombia at present. The data indicate that, for the wildcatting effort, the oil pools of Venezuela have been much bigger than those discovered in Colombia. However, the size of the oil pools in Colombia is impressive—five of over 100 million barrels; four from 10 to 100 million barrels; and seven from one to 10 million barrels, of which four are still being developed. Present drilling costs in Colombia for wildcats—without the preliminary geological and/or geophysical outlay—average for a 7,300-ft well aronud $55 per foot, and the overall outlay runs from $350,000 to a high of $721,300 per well, with an average of around $405,200 per wildcat, according to recent data published covering the years 1951 to 1957, and 55 wildcats drilled for a total outlay of $22.3 million dollars.

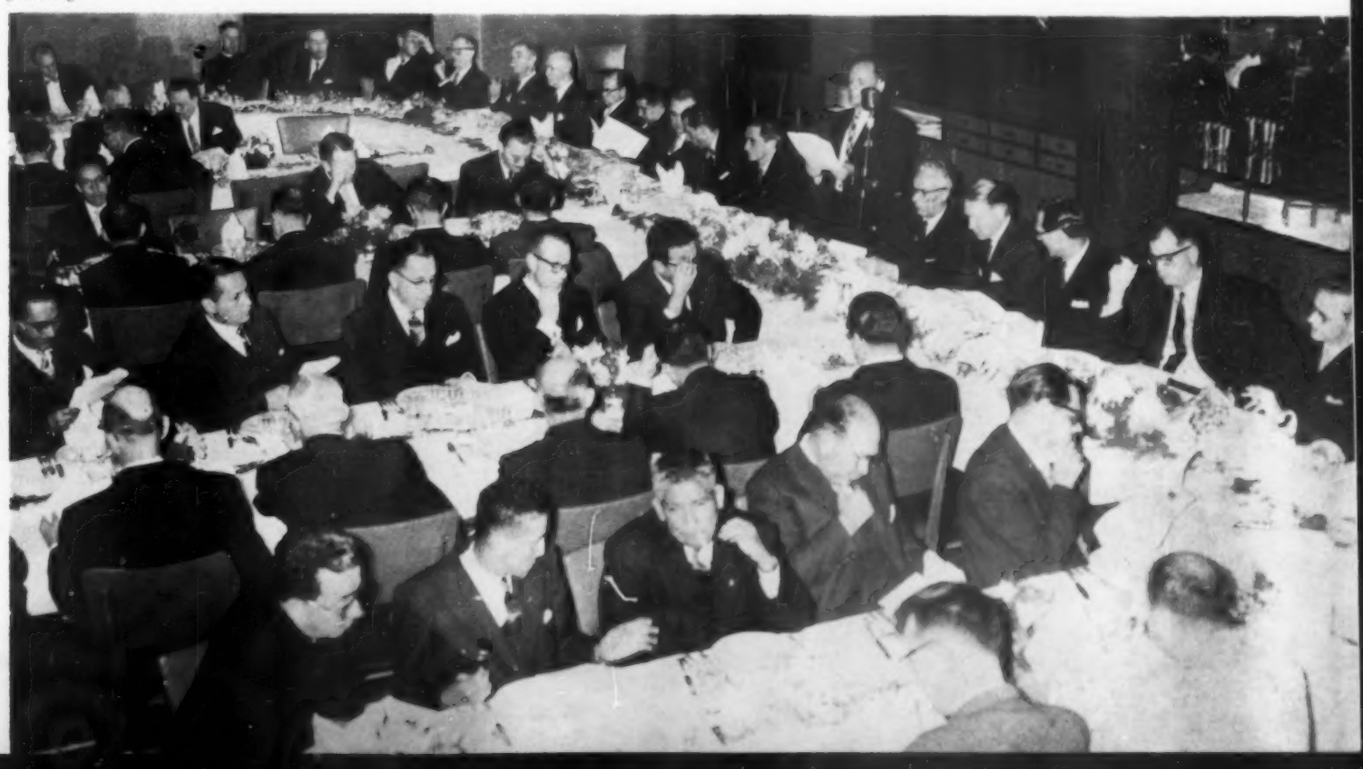
The oil industry is looming more important in the economy of Colombia in view of the overproduction of coffee—the latter brought in 1957 some $412 million in dollar exchange compared to $30 million for the oil industry.The coffee countries have agreed to withhold coffee shipments to peg the world market price. The latter for the Colombian berry is around 50¢ per pound, compared to its recent high of around 92¢, in the New York market. Obviously, Colombia has lost considerable dollar exchange as a result of the drop in the world coffee prices.

Despite the notable progress in Colombia's oil and the greater exploratory activity of the major operators and newcomers—which is most promising—together with the social and fiscal benefits to the country and to the goverment—the 50-50 norm of profits split prevails in Colombia for the oil industry. But group of agitators are not lacking who call for "nationalization" of oil in Colombia. The absurdity of this detrimental type of propaganda is obvious from a consideration of a few economic and statistical data.

Total oil-industry personnel, as of December 31, 1957, amounted to 10,647 persons, of which only 5.7% was foreign. This means that 94% of the personnel is National-Colombian. Wages paid by the oil industry average pesos 2.85 per hour, compared to other industries of the country which range from 85 centavos to pesos 1.10 per hour. The average monthly salary in the Colombian manufacturing industry is pesos 600, whereas for oil industry the average is pesos 1,200, or around $200 per month.

The Colombian oil industry today represents a billion-dollar investment. The net-

Banquet of members of Colombian Petroleum Inst. commemorating 50th anniversary of Colombia's oil industry, held in Bogota early in 1958: The author of this article, as CPI president, addresses the gathering.



profits split of 50-50 actually has worked out during 1953-57 for the oil producers 60-40, the former percentage in favor of the government. For one of the principal operators, the split in favor of the goverment has worked out 53.3%, 52.0%, 61.60%, 64.50%, 55.90% respectively for each year since 1953. With these percentages in favor of the goverment and the balance for the oil industry, the yield on the oil industry investment for the oil producers is less than 5%.

The country's oil-products consumption of 17 million barrels annually is supplied—except for some lubes and specialty products—entirely from indigenous sources, saving the country some $136 million in exchange. For the 12 months ended September 30, coffee brought in only $330 million. Just witness the oil-products import situation for Brazil and the Argentine which calls for a dollar-exchange outlay respectively of $262 million and $300 million annually for these countries. Colombia's oil production supplies the national consumption requirements. In oil marketing there are various firms, financed by national capital—some in part and others completely. The foremost marketer, Esso, has 12% of its shares owned by the Colombian public which receives the corresponding dividends.

TABLE 3—CUMULATIVE OIL PRODUCTION OF COLOMBIA BY OPERATORS—FIELDS—YEARS TO DECEMBER 31, 1957

OPERATOR & TIME PERIOD	FIELD	YEAR Discovered	Cumulative Oil Output—Barrels	TOTAL BARRELS
1. Tropical Oil Co. 1916-1951	1. Infantas	1916	158,429,932	
	2. La Cira	1926	253,423,602	
	3. Colorado	1930	462,596	
	4. Galán	1945	203,959	
	5. San Luis		7,975	
	6. Mugrosa	1929	69,838	412,597,902
2. Empresa Colombiana de Petróleos 1951-1957	1. Infantas	1916	19,299,271	
	2. La Cira	1926	49,820,021	
	3. Colorado	1930	920,526	
	4. Galán	1945	3,940,119	73,979,937
3. Shell Condor, S.A. 1937-1957	7. Cantagallo	1943	5,951,593	
	8. Casabe	1941	123,922,291	
	9. Difícil	1943	6,924,248	
	10. Yarigui	1955	4,220,662	139,718,794
4. International Petroleum (Colombia) Ltd. 1951-1957	11. Buturama	1953	391,534	
	12. Totumal	1951	242,908	
	13. Gualanday	1957	15,201	
	14. Caimán	1954	14,076	
	15. Lebrija	1955	3,132	
	16. Trigos	1954	1,856	668,707
5. Colombian Petroleum Co. 1931-1957	17. Tibú	1940	91,977,000	
	18. Río de Oro	1920	4,213,000	
	19. Sardinata	1950	3,274,000	
	20. Petrólea	1933	32,470,000	
	21. Carbonera	1939	310,000	
	22. Cicuco	1956	512,000	132,756,000
6. Texas Petroleum Co. 1928-1957	23. Velásquez	1946	25,293,499	
	24. Palagua		2,058,171	
	25. Ortega	1951	1,486,285	
	26. Tetuán	1949	243,500	
	27. Caipal	1955	13,084	
	28. Ermitaño		53,700	29,148,239
7. Mobil Oil Co. 1934-1957	29. Las Moras	1926	12,370	
	30. Floresanto	1945	13,258	
	31. Cantagallo	1943	1,444,988	1,470,616
	Total of cumulative production in Colombia 1916-1957			790,340,195 B.

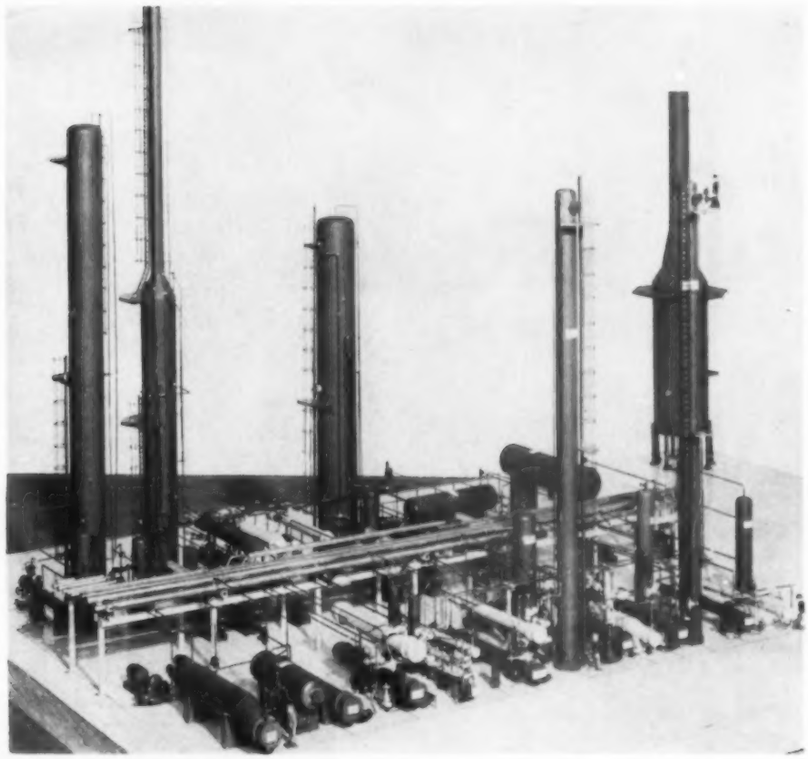
TABLE 4—SUMMARY OF CURRENT DRILLING & PRODUCTION IN COLOMBIA—Week Ending Sept. 14, 1958

	1	2	3	4	5	6	7	8	9	10	11	
Operator	Ecopetrol	Texas	Colpet	Shell	Intercol	Mobil	Colcito	Sun	Rich'd	Amkirk	Anson	= TOTAL COLOMBIA
Rigs:												
Wildcat	2	1	1	1	2	1	0	1	0	1	0	= 10 Wildcat
Field	1	3	4	1	0	0	1	0	0	0	0	= 10 Field
Service	4	5	6	4	0	0	0	0	0	0	0	= 19 Service
Weekly footage	620	4045	4207	4923	408	492	0	0	0	0	0	= 14,695 ft.
Previous Week	201	3879	7707	0	943	1872	0	0	0	0	0	= 14,602 ft.
Oil Output—Aug.												
Crude B/D	27,771	31,546	34,741	34,556	263							= 128,877 B/D
JULY	27,111	30,054	31,387	34,244	226							= 123,472 B/D
JUNE	27,536	30,361	32,020	33,170	82							= 123,169 B/D

If "nationalization" of the oil industry means exploiting all the oil by the government, the following statistics reveal the government would not stand to gain anything. Of the gross output, the official enterprise Ecopetrol already produces 22.6%; this leaves 77.4% to "nationalize" of the latter, the operators pay the government an average of 60% net-profits split; this is equivalent to delivering 46.4% of the oil to the government, which it receives in cash now. There remains 31% of the output, one-quarter of which is produced from fee property and three-quarters from national concessions—which revert at the end of the concession period to the government. De Mares, for instance, reverted to the government in 1951, and is now run by Ecopetrol. All oil properties which may revert will eventually pass over to Ecopetrol. Therefore, 23.3% of what is left of the 31.0% will revert to the government within a relatively short period. This leaves 7.7% of the oil to be "nationalized" by the constitutional procedure of previous indemnity to the owners. The Colombian government has often gone on record, through declarations of the president and of the cabinet ministers, against any expropriation. However, there is not lacking the group of political agitators with published press statements arguing that "nationalization" of oil in Colombia would pull the country out of its present economic difficulties—which obviously would do nothing more than aggravate them. If anything, what the Colombian government should do is to promote a policy of "internationalizing" Colombian oil, place it in an economic and fiscal condition to compete with the lower-cost oil of the competitive oil-supply countries of the world. This would bring greater benefits to the economy and assure a greater development of these energy sources with which the country has been blessed.

A big step in meeting the increasing demand for LPG in Colombia is being taken with the construction of a new natural-gasoline absorption plant for Empresa Colombiana de Petroleos, at El Centro, Santander. The new absorber has a design capacity of 51,400,000 cu ft per day, with initial operation of 48,000,000 cu ft per day scheduled, and will be located adjacent to the present 30-year-old plant. The existing gasoline plant will be shut down.

Construction of the new absorption plant began in May. Design and economics studies were completed last year by The Ralph M. Parsons Co. The same firm is doing the engineering, and supervising the construction work by Colombian personnel. Considerable flexibility is provided to produce various mixtures of the three basic products: stabilized natural gasoline, propane, and butane. A minimum of 70% recovery of the available propane will result, along with essentially full recovery of butane and the heavier components. The unit includes an absorber, rich oil de-ethanizer, propane refrigeration system, depropanizer, and debutanizer.



Scale model of new integrated gasoline plant under construction at El Centro (Ralph M. Parsons photo).

Below: Colombian Petroleum finances building of homes for its labor personnel, near the town of Cucuta. This is the housing project after several years' occupancy (Colpet photo).

Existing compressor equipment is being overhauled, with some revisions and additions to the existing pipelines to and from the field. The old absorption oil-circulating lines are being rehabilitated to serve as a wet-gas gathering system. All dry gas is returned to the field for repressuring, supplemented by the experimental water injection program by Forrest Oil Co. Natural gasoline is delivered 10 miles to Empresa's refinery for blending stocks. The bottled gas is delivered to Bogota and cities along the Rio Magdelena River by barge and pipe line for domestic and industrial use. END

TABLE 5—AREA OF LAND HOLDINGS IN COLOMBIA—FIRM CONTRACTS & CONCESSION APPLICATIONS—AS OF JUNE 30, 1958—OFFICIAL DATA

	Hectares											
	Oil Concession Contracts						Oil Concession Applications Filed					
	Western		Eastern Colom-		TOTALS		Western		Eastern (Llanos)		Totals	TOTAL AREA—CONCESSIONS AND
Operator	No.	Colombia	No.	bia (Llanos)	No.	Total Hectares	No.		No.		No.	Hectares	APPLICATIONS—HECTARES
1. Intercol	40	514,640	5	852,937	45	1,367,577	75	2,746,546	35	5,080,239	110	7,826,785	9,194,362
2. Texas—fee	1	127,205	0		1	127,205							127,205
	17	698,886	6	1,097,227	23	1,796,112	47	2,157,901	9	1,617,011	56	3,774,912	5,571,024
3. Shell	17	726,404	7	1,052,412	24	1,778,817	15	510,407	7	1,277,604	22	1,788,011	3,566,828
4. Mobil	3	147,132	5	599,108	8	746,241	7	259,460	2	199,242	9	458,702	1,204,943
5. Richmond	14	621,797	—	—	14	621,797	9	388,049	8	1,344,640	17	1,732,690	2,354,487
6. Colombian	7	347,599	4	130,018	11	477,618	14	561,544	—	—	14	561,544	1,039,162
7. Ecopetrol:													
De Mares	1	416,000			1	416,000							416,000
Others	4	173,003	0	—	4	173,003	4	192,268	—	—	4	192,268	365,271
8. Cities Service	3	878,870	—	—	3	878,870	8	294,781	7	1,278,409	15	1,573,191	2,452,061
9. Sun Oil Co.	—	—	—	—	—	—	15	549,749	—	—	15	549,749	549,749
10. Intercol-Mobil	12	424,332	—	—	12	424,332	—	—	—	—	—	—	424,332
11. Independents	3	99,062	—	—	3	99,062	10	441,623	—	—	10	441,623	540,685
12. Regalías	—	—	—	—	—	—	7	259,520	—	—	7	259,520	259,520
13. E. Ospina-Racines	—	—	—	—	—	—	3	112,000	—	—	3	112,000	112,000
Hectares: TOTALS	122	5,174,930	27	3,731,702	149	8,906,634	214	8,473,848	68	10,797,145	282	19,270,995	28,177,629

Geophysical crew operating in Venezuela (Creole photo).

Preparing shot holes with exploration team (Creole photo).

Venezuela's oil industry is sound

Long-range projects are under way which will stimulate Venezuela's oil industry. They include a new refinery, new exploration discoveries of major size, and major additions to pipelines.

THE POLITICAL future of Venezuela may be uncertain, as political futures always are, but the same can't be said of her oil industry. In all four major areas of the industry, long-range prospects are good. For example, exploration is looking up. Although the number of new wells this year will be only around 1,300 compared with 1,825 in 1957, results of new concessionaires' work in Lake Maracaibo and the Gulf of Paria have been spectacular. And, so far as production is concerned, it won't hit a billion-barrel year as it did in 1957; but, based on the 2,539,500 b/d average during the first seven months of 1958, it will be only about 6% below 1957, and still above 1956.

Pipelining is another sector which is in full swing, with projects under way or headed for completion this year of facilities to handle transportation of an additional 1.5 million barrels per day of oil.

Refining is looking up too. Three of the established refiners—Creole, Shell, and Richmond—plan substantial increases in their capacity this year. Added to these will be the first new refinery built in Venezuela for many years, the 40,000 b/d Socony Mobil plant at Pto. Cabello.

Marketing: Marketing within Venezuela has long been reserved to Shell and Creole —both of them having incurred a net loss on their interior sales due to the restricted levels which the government has imposed for many years. The major price ceiling is on regular-grade gasoline, which sells at the very low price of 10 centavos per liter at filling station—equivalent to about 13.2 US cents per gallon. This situation slowly is changing, however, as more modern cars come into the country. The new high-compression engines demand premium gasoline which is not subject to price ceilings, and on which the companies make a profit. As the prospects for supplying the interior market become more attractive, more companies are entering the market. Among them are The Texas Co. and Phillips Petroleum which are building chains of filling stations in the interior.

The internal political situation in Venezuela has changed dramatically this year. Beginning with the overthrow of the Jimènez regime, it is heading for a climax when the national elections occur—probably before the end of the year. The governing junta which took over has changed its membership under the strain of attempted coups and internal dissention, but it is maintained in power by the determination of the great majority of Venezuelans to oppose a return to the old type of dictatorial regime which might result of a coup overthrew the junta before elections were held. This stabilizing attitude, plus the great personal popularity of Wolfgang Larrazabal, head of the junta, has held the situation in check.

Two major candidates, Bettancourt of the Accion Democratica and Caldera of the COPEI, represent respectively the principal left and right of the opposition for the forthcoming elections. Both have expressed their views on the oil industry's role in the country (see *World Petroleum,* July 1, 1958), and both appear to realize the importance of stable and continuous equitable treatment of the industry if it is to prosper. It is a source of concern not only to the companies, but to the country itself which is dependent for 75% of its national revenue on petroleum.

In any case, the oil industry in Venezuela is hard to scare. Rumors fly fast, but within the companies are people with long memories which go back to darker days than today. The industry survived then, and it probably will survive in the future. Even in these troubled times, there is a genuine understanding between the companies and the government. This is apparently founded on the persons within the government who are responsible for petroleum and who are experienced in oil—an industry where long experience is absolutely necessary to understand it. Added to this is the fortunate mutual history between Venezuela and the United States, which is totally without serious incidents such as occurred between the USA and Mexico, for example.

Exploration Looks Up: Major 1958 developments in the industry occurred in exploration. Although the pace of drilling slackened in Venezuela during 1958, and is going to be between 30% and 40% lower, the statistics don't tell the entire story. An upturn, evident during the latter half of the year, indicates the 1959 activity will be up considerably—probably not to 1957's record levels, but almost.

Especially evident in exploration are the successes scored in Lake Maracaibo by new companies. They have added millions of barrels of reserves—and still news of new discoveries continues to come thick and fast. Much of the detail of their new finds (during the first half of 1958) is covered in *World Petroleum,* September issue. Recent developments are as follows:

Among the companies which have succeeded in their lake search is Signal Oil & Gas of Venezuela—in which Hancock, Pure Oil, Standard of Ohio, and Signal participate jointly. Signal's first discoveries in the lake have been followed in recent months by a fifth exploratory discovery, No. 6-X Centro, which flowed 40.7 API gravity oil during July at 5,880 b/d through 203 ft of perforations from the C-5 and C-6 Eocene zones. The well extends Signal's previous finds (see *World Petroleum,* September) by about 1¼ miles to the southwest. In September, another discovery was made at Centro 7-X, which flowed 6,600 b/d of 27.3 API gravity clean oil from perforations in the upper Eocene.

Venezuelan Sun et al. have made another discovery on Block No. 1 in the lake. Two recent wells totaled 9,385 b/d from the Eocene. SVS 16, larger of the two, was a dual producer and, on a ¾-in. choke, tested 3,265 b/d of 35.2-gravity crude and 5,180 b/d of 37.5-gravity. SVS 15 flowed 940 b/d on a ½-in. choke.

Phillips Petroleum Co., drilling on Block 17 in the lake, had a discovery at a well designated LPG 13-2. It is the second test on the concession which Phillips obtained for itself and a group of companies last year, and on both wells the company has released very little information. The first well, LPG 17-1, was drilled on the north edge of the concession. Reportedly, it was dry. The LPG 13-2 discovery is about 5½ miles southwest of the nearest production. Phillips—which is operating for itself, Sunray, Ashland Oil, Kerr-McGee, Western Natural Gas, El Paso Natural Gas, Pacific Petroleums, and Canadian Atlantic—is now drilling a new well on Block 12. It is LPG 14-3, 1¾ miles southeast of the discovery.

These lake highlights have been matched by offshore successes in Venezuela's Gulf of Paria. There, a combination of companies, operating as Paria Operations Inc., found oil on the first try with Poza 112-1 well. It had been rumored a good producer for a long time before the company revealed information, but reportedly 1,500 b/d of 20 API gravity crude was obtained in drill-stem tests of two zones below 4,000 ft. The second well, Poza 103-A-1, four miles northwest, was dry at 12,626 ft, although casing had been set below 11,000 ft. The rig is now working on another platform, 8½ miles northwest of Poza 103.

Efforts by the Venezuelan government to interest companies in border acreage, by requiring them to take grants there with the more desirable lake and other acreage, have not been conspicuously successful to date. Creole gave up [illegible]00 acres along the Colombian border wi[illegible]t having drilled there; and Shell gave up 49,420 acres near the Colombian border in Tachira state, for which it had paid $971,000 in bonuses, without drilling.

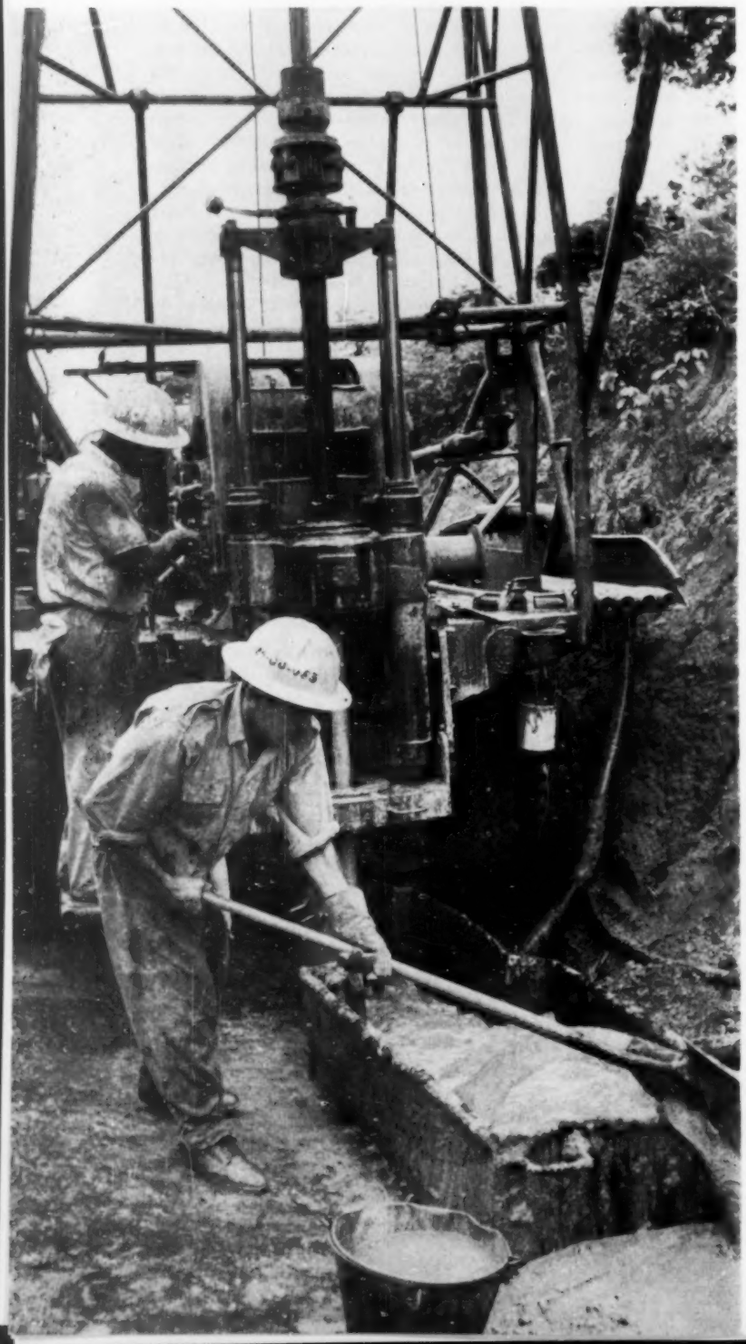
Not all the news from drilling has been good either. The saddest disappointment of the year comes from the Monagas blocks (eastern Venezuela). There Pan Venezuelan Oil Co. [subsidiary of Standard Oil Co. (Indiana)], released two rigs late this year which had been drilling in Monagas's southern portion. Four dry holes had been drilled early in 1958; and another duster, Mona-28-2, was abandoned at 9,029 ft on Block 28 later this year.

Venezuelan Atlantic Refining Co. abandoned Paez 2, its second dry hole in Barinas (southwestern Venezuela), at 9,478 ft. The first well, Paez 1, was dry at 9,358 ft. Creole's well in the area, Lechozote 1, also was dry.

Production Decline: The decline in Venezuela's production this year compared with

Bolivar Peak, 16,523 ft high. In Merida state, Venezuela.

Hard work, no play as shot hole crew works in the Venezuelan rain (Creole photo).



1957 represents about 320,000 b/d. It is due to a number of factors—including import restrictions in the United States and warmer weather during the 1958 winter. Also, the effort of re-opening of the Suez Canal cut off the emergency market for Venezuelan crude; and, finally, there was the decline in USA economic activity. About 35% of the decline is attributable to the import restrictions (amounting to around 168,000 b/d). Warm weather and the USA economic decline appear responsible for the largest share of the percentage decline.

The new companies in Venezuela contributed considerable support to 1958 production levels. Superior Oil was up to 47,000 b/d during the last week of September, and will be up to about 53,000 during the latter half of the year. San Jacinto Venezolana CA will be above 50,000 b/d as soon as facilities are complete.

Gas Use Rising: The use of natural gas has increased, to over 35% at present. The rest is flared, but projects now under way will utilize an increasing share of it, and probably half of the natural gas produced will be utilized within five years.

Gas re-injection is growing rapidly. Creole Petroleum Corp. has done most in this respect—with Tia Juana No. 1, 2, and 3 in Lake Maracaibo in operation now, all of them giants. A fourth plant at Bachaquero, near Tia Juana town, just began construction.

Shell is planning a large plant of new and different design (see *World Petroleum*, July 1, 1958), and Mene Grande has built a gas plant at Limon field to inject about 15 mmcf daily—with smaller plants at Oscurote, Norte, Mata Grande, Mata, and Mapiri fields. About 30 gas-injection plants were working at the beginning of 1958, with a total daily capacity of about 705 mmcf.

A project to move liquefied methane by tanker is being experimented with by Continental Oil Co. and Union Stock Yards & Transit Co., of Chicago—to be operated jointly through a company known as Constock. Trials of a refrigerated vessel are under way for methane transportation by tanker to Europe. The project has a fabulous future if the transport problem can be worked out. Methane, however, is not considered liquefied petroleum gas in the usual sense; it requires very intense refrigeration (to minus 285 F). A contract for supply of the gas is pending now, awaiting government approval. Socony Mobil reportedly is to supply the gas.

Several LPGas plants are now in operation. Creole Petroleum put the first into operation, during the summer of 1958, at Amuay. Mene Grande, which has used LPGas to fuel its vehicle fleet for years, now has a new plant which is just beginning LPGas exports.

1.5 Million B/D in New Transport: There are projects, either completed this year or under way, which will add 1.5 million barrels daily to the transportation system of the country. Socony Mobil de Venezuela began operating its 212-mile 20-in. crude line from Barinas to El Palito this year.

Capacity is 100,000 b/d, but it will operate at about 50,000 b/d temporarily.

Creole began construction of a 90-mile 30-in. line in eastern Venezuela which will have a capacity of 300,000 b/d to 500,000 b/d, depending on viscosity of crudes moved.

Cia. Shell de Venezuela is building an extensive new pipeline network along the eastern shore of Lake Maracaibo and a terminal at Pto. Miranda. A 30-in. line (heated) will move crude from Bachaquero to Cabimas, with two trunk lines leading from Cabimas to Pto. Miranda of 34-in. and 30-in. diameter, respectively. About 400,000 b/d will move from Bachaquero-Cabimas, and about 800,000 b/d to Pto Miranda from Cabimas.

A gas line is being completed now to Caracas from the Anaco area by Petrogas SA. It will supply the capital with gas from Atlantic Refining fields.

Creole is building a very large system under water for gathering natural gas in Lake Maracaibo. The system will include 18 separate lines—some of them going up to 40-in. diameter.

Much in the news recently has been the decision of a group of Caracas financiers to form Flota Petrolera Venezolana CA (Venezuelan Petroleum Fleet) to carry Venezuelan crude. It has the government's blessing, and financial backing from a French-Swiss group which will finance up to 80% of the cost of new tanker construction. The project is not certain of success, however, since Venezuelan tankers are subject to as high costs of operation—especially salaries—as are those of the USA, and this places them at a competitive cost disadvantage.

VENEZUELAN CRUDE PRODUCTION SINCE INCEPTION

(Annual Average in Barrels Per Day)

Year	Venezuelan Crude Production	% of World Production
1918	917	0.1
1919	830	0.1
1920	1.254	0.1
1921	3.980	0.2
1922	6.224	0.3
1923	11.495	0.4
1924	25.183	0.9
1925	55.405	2.0
1926	100.022	3.4
1927	171.691	5.0
1928	286.546	7.9
1929	374.924	9.2
1930	375.443	9.7
1931	319.762	8.5
1932	318.357	8.9
1933	232.981	8.2
1934	373.707	8.9
1935	407.075	9.0
1936	422.691	8.6
1937	509.087	9.1
1938	515.583	9.5
1939	562.834	9.9
1940	508.520	8.7
1941	624.979	10.3
1942	405.340	7.1
1943	491.575	8.0
1944	702.289	10.3
1945	885.917	12.5
1946	1.064.683	14.1
1947	1.191.037	14.4
1948	1.338.831	14.3
1949	1.321.295	14.2
1950	1.497.890	14.4
1951	1.704.621	14.5
1952	1.804.702	14.7
1953	1.765.864	13.7
1954	1.896.283	13.9
1955	2.157.861	14.2
1956	2.457.933	14.8
1957	2.779.245	15.7
1958	2.608.700 (est.)	14.4 (est.)

New Refinery Plans: There are major additions at three plants under way, and a large new refinery is planned. Socony Mobil de Venezuela will build a 40,000 b/d plant at El Palito, terminus of its new pipeline from Barinas. The plant has received government approval. Construction is now under way.

Creole Petroleum Corp. added a fourth atmospheric pipe still to its Amuay Bay refinery, at the mouth of Lake Maracaibo, this year. It increased Amuay's capacity to 328,000 b/d, almost the world's largest.

Creole put a new lube plant into operation during 1958, at Amuay, using the Tia Juana medium distillates to produce a full range of motor-oil and industrial-lubricant products. A 17,000 b/d Hydrofiner, the first in Latin America, went onstream at Amuay in January 1958. It will remove sulfur from Tia Juana medium diesel oil down to 1% by weight of sulfur.

Cia. Shell de Venezuela is adding an 80,000 b/d atmospheric distillation unit which will raise capacity at its Cardon refinery to about 283,000 b/d.

Richmond Petroleum Co. has expanded its Bajo Grande plant this year to around 15,000 b/d from 10,000 b/d by the installation of additional heat exchangers and feed pumps.

Petrochemical Problems: The Minister of Mines and Hydrocarbons, Dr. Pèrez de la Cova, inherited the job of assessing the sad results of the government's entry into petrochemicals at Moron, a little seacoast town on the Caribbean. About $300 million was to have been invested in a huge petrochemial complex, but the downfall of the Jimènez regime revealed extensive mismanagement. A report by Dr. Moreno, appointed head of the Petrochemical Institute (Instituto Venezolano de Petroquimica), revealed $134 million had been spent so far, including such items as $900,000 for a residence for the former president of Petroquimica.

A respected government official, Dr. Gustavo Théry Fombona, director of the Office of Hydrocarbons, has been appointed honorary head of the institute, and now the government is attempting to do what it can with what remains. Already built is a 3,000 b/d pilot-plant refinery with complete facilities which the government is using to gain refinery experience. It is not as yet in full operation, but its output will be sold on the local market and prices have been posted which, for regular-grade gasoline, was 8.60 cents per gallon, about one cent below posted Caribbean prices.

There is also a German-built chloric-soda plant with an annual output of 10,000 tons of chlorine and 11,200 of caustic soda. A series of synthetic fertilizer plants are now in place, but it is not known whether these are working. There also exists in completed form the 43-mile 12-in. gas line from Guacara which is to supply these facilities at Moron with their raw materials.

The government originally went into this petrochemical scheme because, according to the former regime, the companies operating in Venezuela would not enter the field and because it was a necessary one for Venezuela. The companies have not entered the field because they do not believe it is a paying proposition. The petrochemical field is evolving so rapidly that plants must be large, very costly, and very profitable to pay out in a few years—after which they may become obsolete. Despite its first experience, however, the government of Venezuela has announced it will continue this project. END

Venezuela

Distribution and Productivity Data on Oil Wells
(Data As of June 30, 1958)

Field	Producing	Non-Producing	To Be Abandoned	Abandoned	Total
Cabimas	760	378	156	401	1,695
Tia Juana	915	757	6	65	1,743
Lagunillas	1,778	941	30	269	3,018
Bachaquero	935	1,157	27	326	2,445
Mara	53	59	7	14	133
Boscán	295	54	2	14	365
Other fields	1	34	15	334	384
Urdaneta	4	8	—	18	30
Cumarebo	22	52	3	77	154
Motatán	—	5	—	6	11
La Concepción	78	67	66	8	219
Sibucara	5	2	3	2	12
La Paz	43	100	32	11	168
Moján	3	—	1	—	4
Mene Grande	483	166	75	43	767
Ceuta	5	3	—	—	8
Tiguaje	18	8	—	18	44
Mene Maurosa	57	21	171	166	415
Hombre Pintado	46	9	18	7	80
Ensenada	1	—	—	5	6
Cruces Manueles	130	57	31	44	262
West Tarra	32	16	3	3	54
Rio de Oro Mamón Area Expl. Lago	—	14	1	13	23
Total Maracaibo:	5,664	3,908	647	1,844	12,063
Barinas	49	20	—	37	106
Mulata	105	82	9	45	246
Santa Barbara	201	145	3	62	411
Aguasay	17	2	—	2	21
Temblador	72	23	—	28	123
Tucupita	40	3	—	13	56
Oritupano	33	16	—	21	70
Quiriquire	488	60	6	77	631
Jusepin	138	222	16	73	449
Exploratory, Muri, Travieso, Mene Grande and Tocat	128	220	—	263	611
Total Maturin	1,222	778	34	584	2,618
Oficina	351	200	45	76	672
Guara	232	85	14	45	376
Nipa	281	110	12	14	417
Leona	63	65	16	27	171
Chimire	113	89	3	16	221
Dacion	93	22	—	7	122
Soto	117	73	9	15	214
Merey	54	110	2	12	178
Boca	19	45	—	6	70
El Roble	20	28	—	—	48
Socorro	—	2	—	4	6
Pelayo	3	3	—	7	13
Exploratory, Fria, San Joaquin, Santa Rosa, Santa Ana, Quimare, Yopales, Tapuca, Guico, Guario, Oscurote, Mata, San Roque, Las Mercedes, Palacio & Other fields	1,216	838	17	818	2,889
Total Barcelona	2,562	1,670	118	1,047	5,397

First Borden report proposes close controls in Canada

ESTABLISHMENT of a national energy board with sweeping powers over Canadian oil and gas imports, exports, and transportation has been recommended in the first report of the Borden commission filed with the Governor General-in-Council. A second report is expected to be filed before the end of this year in which the commission will deal with the possible substitution of Canadian for imported oil processed by Montreal refineries. The second report also will cover other facets of the problem of markets for Canadian crude. In filing its first report, the commission warned that nothing said in it should be construed as forecasting what recommendations may ultimately be made.

Despite this injunction, there are a number of recommendations in the first report which seem significant to some students of the document. The commission recommends that the proposed National Energy Board be empowered "to grant, revoke, or suspend licenses, upon such terms and subject to such conditions, if any, as the board may decide . . . for the export from or import into Canada of any form of energy or sources of energy which may be specified by the Governor-in-Council." In the case of internal movement within the dominion, it is recommended that the National Energy Board have control through licenses "for the transmission across provincial boundaries by pipeline of crude oil and petroleum products and natural gas and byproducts of the processing thereof."

In exercising its responsibility with respect to the issuance of licenses, the board "shall take into account all matters which in its opinion are required to be considered by it in the public interest [including] the advisability of encouraging the development in Canada of processing industries . . . the economic feasibility of the pipeline project . . . the financial structure, ownership, financing, engineering, and construction plans of any applicant. . . ."

In the case of pipelines crossing provincial borders, the commission recommends that the energy board examine the direction of movement, destination, and volume of the oil to be shipped.

To make sure that the proposed board has plenty of jurisdiction, it is recommended that it have authority "to study, review, and from time to time recommend to the Minister of Trade and Commerce such policies and measures as it considers necessary or advisable in the public interest for the control, supervision, conservation, use, and development of energy and source of energy and for the production recovery, manufacture, processing, distribution, transmission, sale, purchase, exchange, disposal, import or export of energy and sources of energy within, to, or from Canada."

Import licenses for crude or products would be for a period of 12 months, only and the importer would be required to report quarterly on specifications, source, "the name of the supplier and the price charged or paid, the name of the transporting agency, and the costs of transportation, the currency or currencies in which any payments have been or are to be made . . . and other relevant information." The proposed board obviously would be able to require the oil industry to supply all data covering its operations and competitive position in the market. The industry would, in effect, become a public utility.

Chapter 1 of the Borden commission report deals with export licensing of natural gas and crude oil, although primary emphasis is on gas. Criteria are set up for the proposed National Energy Board to consider when granting export licenses. These include quantities of gas available for export, quantities the exporter has under contract, and prices to be paid; terms under which the export contract is made. Permits would be limited to a 25-year term.

For the purpose of coordinating regulation of trade in gas between Canada and the USA, it is recommended that a commissioner of the US Federal Power Commission sit with the Canadian board as an *ad hoc* observer without vote when the FPC is considering a Canadian import or export license, and that the Canadian board send a similar commissioner to sit with the FPC as an observer when the USA has a Canadian deal under scrutiny.

The Borden commission made a very detailed report on the organization, financing, and operations of Westcoast Transmission Co. and Trans-Canada Pipe Lines Ltd. Westcoast came in for criticism with respect to capital gains made by its promoters in the purchase of stock at low prices. "We are of the view," the commission said, "that the financing of Westcoast, insofar as the issuance of its common shares is concerned, was done in a manner which has resulted in those few who were associated in the venture receiving potential capital profits beyond any amount which, in our opinion, could be considered as reasonable or adequate compensation for the risks involved.

The commission objected to the fact that Westcoast sold gas to Pacific Northwest Pipeline Corp. in the United States at prices below those charged Canadian customers. An inquiry to determine whether Canadian consumers are subsidizing the sale of gas to Pacific Northwest is recommended to the present Canadian Board of Transport Commissioners.

The Borden commission observed that Pacific Northwest needs more Canadian gas, and recommended that selling prices be considered before an export license is granted.

In the case of Trans-Canada, it is recommended that the promise to give a license to export 200 million cubic feet of gas per day from Emerson, Man., to the USA be withdrawn. Finding was that Trans-Canada does not have enough gas under contract to permit such a large export sale and still supply its Canadian commitments.

So far as Canadian gas reserves are concerned, the Borden commission believes that enough gas can be developed to supply Canadian needs and meet reasonable export demand. "It is our judgment," the commission wrote, "that the entry of Canadian natural gas into available United States markets, on a moderate scale, is a highly desirable step." Various authorities were quoted that Canada now has a proved gas reserve of 20.55 to 27.5 trillion cubic feet and an ultimate of about 300 trillion. Based on a drilling activity of 350 to 400 exploratory wells per year in Alberta, it is estimated that new gas discoveries will be in excess of two trillion cubic feet per year. Canadian demand is not expected to reach two trillion cubic feet per year until after 1987. In that year Alberta may have disposable reserves of 52 trillion cubic feet.

The prospect of delays in obtaining approval of export deals and of close bureaucratic supervision of oil lines and of the oil trade in general dismayed the industry and the investing public when the Borden commission's first report was issued. Prices of key stocks were sharply depressed. The industry is awaiting the second report with great interest. END

Acoje Oil Exploration & Drilling Co.'s Bethlehem "big rig" being raised for drilling on the Bogo structure in Cebu: First test was abandoned at 5,310 ft.

Philippine petroleum possibilities

Sporadic exploration for oil has been conducted in the Philippines since 1896 without commercial results. More recently, a considerable amount of geological and geophysical reconnaissance work has been done in five sedimentary basins. Deep tests are planned on a number of concessions.

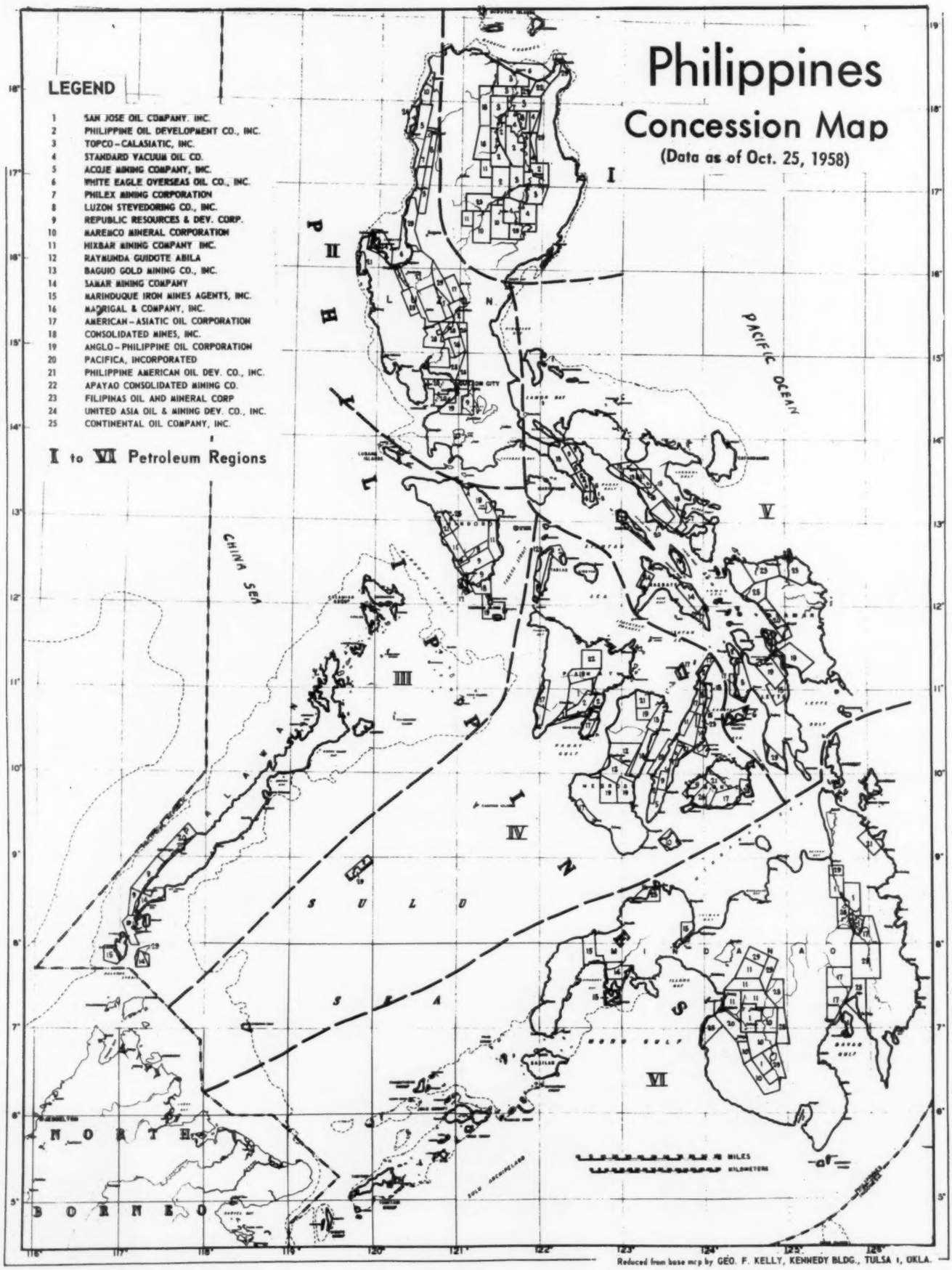
by Chester A. Baird

FIVE sedimentary basins, containing a considerable thickness of an alternating sequence of shales, clays or siltstones, limestones and sandstones, deposited while those basins were inundated by an extension of the sea, are exposed on the present land area of the Philippines. Portions of one or more additional basins, the sediments of which were also deposited in sea bottoms, have been identified along the margins of the islands of Mindoro, Negros, Cebu, Bohol, Leyte, and Samar, as well as the Bondoc peninsula, Camarines Norte and Camarines Sur—the latter three being located in the southern part of Luzon island. The limits of these land-exposed portions cannot yet be defined because a greater area apparently is covered by deep water of the present seas.

All of the marine sediments, which in many places exhibit oil and gas seepages, were deposited during the Tertiary period, and can be correlated definitely through paleontological examinations with similar deposits found in Borneo, Java, and Sumatra.

Philippine petroleum search is discussed as follows by basin from north to south,

CHESTER A. BAIRD, president and general manager of San Jose Petroleum Inc., has been identified with petroleum exploration and development since 1916. A graduate of Ohio State University, Mr. Baird served as a pilot in World War I, and then joined Gulf Oil Corp., where for 22½ years he devoted most of his time to foreign exploration operations. First as a geologist and later as assistant manager of Eastern Hemisphere operations, he spent 19 years in Gulf's foreign service. He also managed the Venezuelan Atlantic & Refining Co., in Venezuela, for two years. From its inception, Mr. Baird has been in personal charge of all phases of San Jose's Philippine exploration.



Reduced from base map by GEO. F. KELLY, KENNEDY BLDG., TULSA 1, OKLA.

rather than according to historical sequence:

Cagayan Basin, Northeastern Luzon: This flat to hilly sedimentary area is open to the sea at the north, and is bordered on the east, west, and south by mountains composed of igneous and metamorphic rocks. It has an approximate north-south length of 120 miles and an east-west width of 30 to 35 miles. Intensive light oil seepages occur along the margins of this basin, in particular in the western portion.

The greater part of this basin is occupied by petroleum concessions of Philippine Oil Development Co. Inc. (PODCO., the joint holding of California Asiatic and Texaco Overseas (commonly identified as "Caltex"), and Standard Vacuum Oil Co. (Stanvac). A portion of the PODCO acreage is operated on a 50-50 basis with Caltex and another portion under an option agreement with Stanvac.

All three companies have performed extensive geological studies of the basin. In 1956, PODCO flew several airborne magnetomete profiles across the basin. Late in 1956, and continuing into early 1957, Stanvac employed a Robert Ray gravity-meter party for an experimental gravity program of some 800 stations. This survey was subsequently expanded during 1957. About May 1957 and continuing until April 1958, Stanvac performed seismic surveys in this basin, using a United Geophysical Co. party.

During 1956, PODCO drilled its Tumauiini No. 1 well on the large, impressive Tumauiini anticline. The well was lost at about 10,400 ft because of caving hole. During 1957, PODCO-Caltex drilled Tumauiini No. 2, one kilometer north of No. 1, which penetrated to 13,512 ft, where it was terminated because of cave-ins and high costs. Also during 1957, Stanvac drilled Faire No. 1 on the Faire anticline to 10,324 ft, where steeply dipping beds were encountered and the hole was abandoned.

It is now known that the Faire and Tumauiini anticlines and the three mentioned well sites are located in the thickest part of the Cagayan basin where there is a Tertiary section of at least 20,000 ft, possibly as much as 30,000 ft. The apparent principal reservoir objective in this section is a basal sandstone section; hence, the three tests were not diagnostic.

Stanvac completed its second deep test (Ipil 1) on its concession No. 10 in August at a depth of 7,260 ft. Gas was found in the Miocene at 4,350 ft to 4,370 ft with an indicated flow of 7 mmcf, which is not considered commercial at that particular location. A second test (Abaca 1) was in progress in late October at a site 25 miles southeast of last year's Faire dry hole. Ipil 1 was located on a seismic structure which has no surface expression.

The two Tumauiini wells drilled by PODCO encountered a continuous siltstone section of over 10,000 ft thickness below the superficial beds; however, sandstone laminae in the siltstones carried natural gas of low volume but very high pressure, necessitating the use of 120-lb drilling mud.

The possibilities of this basin continue to be excellent where reservoir beds are within drilling reach.

Central Plains (or Valley) Basin, Central Luzon: Extensive geological, magnetometer, and gravity-meter surveys performed in this flat accessible basin by San Jose Oil Co. since June 1956 prove the presence of a very thick sedimentary section under the greater part of its 125-mile length by 40-mile width, extending from the vicinity of Lingayen Gulf on the north into Manila Bay on the south.

About 1952, PODCO drilled two dry holes to around 1,250 ft in the southern portion of the basin. The north half of the basin exhibits several NW-SE trending anticlines, whereas no structures are exposed in the southern half because of a thick mantle of Recent river deposits. Gravity-meter surveys in this southern half reveal several anomalies which appear to have promise but which require further detailed gravity and seismic studies for proper evaluation.

Three companies have concessions blanketing the principal area of the basin: San Jose PODCO, and Republic Resources & Development Corp. (REDECO). This basin has an excellent network of roads, several cities, and hundreds of villages; and is the most accessible and populated area of the Philippines. As regard petroleum possibilities, it has a rank certainly equal to the Cayagan basin—probably greater because it has a greater number of potential reservoirs in its lower Tertiary section and lacks the over 10,000 ft of caving siltstones which have proved so treacherous to drilling efforts in the Cayagan basin.

The San Jose 1956 airborne magnetometer survey, which covered the north half of the basin, was participated in by PODCO. In late 1957, San Jose contracted an 18 months gravity-meter program with Century Geophysical Corp. The survey began in January 1958 in the Central Valley basin, employing two land parties and one marine party. PODCO is participating in this program in the north half of the basin; in the south half, the program is a 50-50 arrangement between REDECO and San Jose, including a ground magnetometer survey.

Iloilo Basin, in the southern part of Panay Island: This hilly to flat, accessible basin has a north-south length of 40 miles and an east-west width of 30 miles, and is open to deep water on the south, in which it can extend for at least an equal area. It may also extend around the southwestern tip to the western margin of the island. The high mountains forming the boundary between Antique and Iloilo provinces form the western edge of the basin where the Tertiary section approximates 10,000 ft to 15,000 ft in thickness. The basal part of this section is a thick porous sandstone of indicated lower Miocene age. This sandstone does not outcrop along the eastern igneous wall of the basin, and must either pinch out or grade into shale somewhere in the 30-mile width, in which interval several structures are present. Several natural-gas seepages have been located and sampled; one sample shows the presence of ethane.

In 1952, PODCO drilled Oton No. 1 to around 6,250 ft, an undiagnostic depth, in the south-central part of the basin, based on a limited seismic survey. In the two-year interval subsequent to June 1956, San Jose performed extensive geological and airphoto studies over the basin, as well as an airborne magnetometer survey plus a preliminary reconnaissance gravity-meter survey—the latter along the road network of the Iloilo basin. The magnetometer and gravity surveys were performed jointly by San Jose and PODCO. In May 1958, PODCO ran several seismic reflection profiles in its concession blocks. Although this study disproved the presence of a "high" at the site of the Oton well, it gave encouraging information as to the thickness of the section in a considerable part of the basin (8,000 ft to 10,000 ft.), proving also a gravity high found in the 1958 work. Concessions of San Jose and PODCO cover practically all of the exposed area of this basin.

Cotabato Basin, in the western part of Mindanao Island: Most geologists limit the extent of this basin to Cotabato province and therein to a NW-SE length of 80 miles and an NE-SW width of about 35 miles. However, this basin has a window opening westward to the sea and could extend in width many miles in that direction under deep water; furthermore, there is good evidence indicating that its length extends northwesterly an additional 50 to 60 miles into Lanao province under the recent volcanic debris and thick lava flows of the Lanao area.

Petroleum concessions of San Jose, Maremco Mineral Corp., and Hixbar Mining Co. cover the area of the basin. In the northeast corner of the basin, there is a well-known seepage of oil which flows one barrel per day. No drilling has been done in this area. San Jose has carried out geological and airphoto examinations over the entire basin area since August 1956, and has also covered it with an airborne magnetometer survey. San Jose recently arranged for a more detailed airphoto coverage of this area by the Philippine Air Force in mid-1958, in which Maremco may participate. In October, San Jose began gravity surveys over its two concessions. Concession No. 33, owned by San Jose, includes the most symmetrical anticlinal dome so far reported in the Philippines; this is the Mt. Roxas structure of 10 miles length by 4.5 miles width, plunging at either end to the floor of the basin and rising to an ele-

vation of over 2,000 ft along the crest. A satisfactory thickness of alternating sandstones, siltstones, and limestones of marine origin is exposed on the rim of the basin and is believed to underlie much of the area.

Agusan-Davao Trough, eastern Mindanao: A deep indentation or trough, of about 30 miles width bordered by north-south trending mountains, bisects the 150-mile north-south length of eastern Mindanao. Tertiary sediments were deposited over much of this basin, in particular in the northern half of Agusan province. Two anticlines, each of at least 10 miles length, are present in this northern half both concessioned to San Jose. Two anticlines are also present at the Davao end of the trough, one under concession to Acoje Oil Exploration & Drilling Co. (Acoje) and one (Samal Island) owned by San Jose. In the Agusan area, the three San Jose concessions are bordered by a REDECO concession and one issued to American Asiatic Oil Corp.

San Jose has been exploring the area with geological teams since July 1, 1956, and has also covered the entire trough with an airborne magnetometer survey. A San Jose gravity-meter survey is scheduled for both the Agusan and Davao areas late in 1958; this survey will also extend over the REDECO concession.

Airphoto coverage of the Agusan area was made by the Philippine Air Force during June 1958 under arrangements made by San Jose in which REDECO and American Asiatic participated. No drilling has been done.

American Asiatic is reported to have performed topographic mapping and geological studies in its concessions. The REDECO concession is included in an operating-management agreement with San Jose, whereby the latter company performs the exploration work in this basin as well as in the south half of the Luzon Central Valley basin.

Undefined basins, in large part covered by present seas: The approximate southern one-fourth of Mindoro island exposes an attractive folded section which may have a thickness of over 10,000 ft. This Tertiary marine sequence, w[illegible] thickness, continues along the ea[illegible]nd western margins of the island. The mountainous north-south core of the island includes identifiable Jurassic beds which are reported to show only a slight degree of metamorphism. The three soley-owned REDECO concessions apparently cover the most promising area; in these concessions, there is present a very active light-oil seep and a separate strong natural-gas seepage. REDECO has been active since mid-1957 with engineering and geological investigation. In late 1958, REDECO plans to drill a 5,000-ft slim hole if it can obtain dollar allocations from the Philippine Central Bank to cover the purchase or contracting of drilling equipment.

Cebu Island: Both the eastern and western margins, also the northern end of this island, exhibit several thousand feet of Tertiary marine limestones, shales, and sandstones. There are several active light-oil seeps issuing from these sediments; in addition, small noncommercial oil and gas shows have been noted in the many test holes drilled since 1896.

First known drilling for oil in the Philippines was in 1896, near the town of Toledo, with an active oil seep. At least two holes, one to 743 ft and one to 1,118 ft, showed oil but were abandoned because of political disturbances. At some later time, probably in the early 1900's, another hole was drilled to approximately 500 ft and filled with clean oil, reported to be 30-API. This hole is still open, and is producing an average of one barrel per day with primitive bailing equipment. It is the only known hole in the Philippines which is producing oil. The accumulation is on a small anticlinal nose against a fault. A considerable section remains to be tested here. PODCO has a concession (No. 4) nearby on which PODCO-REDECO have made a 50-50 operating arrangement which also includes PODCO'S concession No. 6 and REDECO'S adjoining concession No. 72, both located in the southern portion of Cebu.

PODCO and its predecessor company, Far East Oil Development Co., have drilled at least three holes on a north plunging anticline on the northern tip of Cebu—two during 1940-42, to depths of 6,010 ft and 8,311 ft, and one during 1947 to 9,950 ft. It is reported that all three wells reached the igneous-metamorphic basement at the bottom of the Tertiary section. Oil shows were recorded at several depths, mainly associated with limestones.

Acoje has two concessions on Cebu, one at the north end and one at the south end. In 1957, it drilled numerous shallow (500-ft to 700-ft) structure holes, which were surveyed by a Schlumberger electric logging crew, along the Bogo anticline, near the town of that name. In early 1958, Acoje drilled Libertad No. 1 on this anticline to 5,810 ft where the hole was abandoned. Some oil shows were reported. It is also

Acoje Oil Exploration & Drilling Co.'s "small rig" drilling a 750-ft "strat" test.

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reported that the hole encountered andesinite at bottom, which may represent an old igneous intrusion rather than basement. Acoje owns a new Bethlehem rig and a structure-hole rig, both operated by American crews. It has three geological parties in Cebu. Libertad No. 2, the second deep test, is planned on the Bogo anticline as soon as the current structure-hole program and a gravity survey started during June 1958 by a Century party establishes a suitable location.

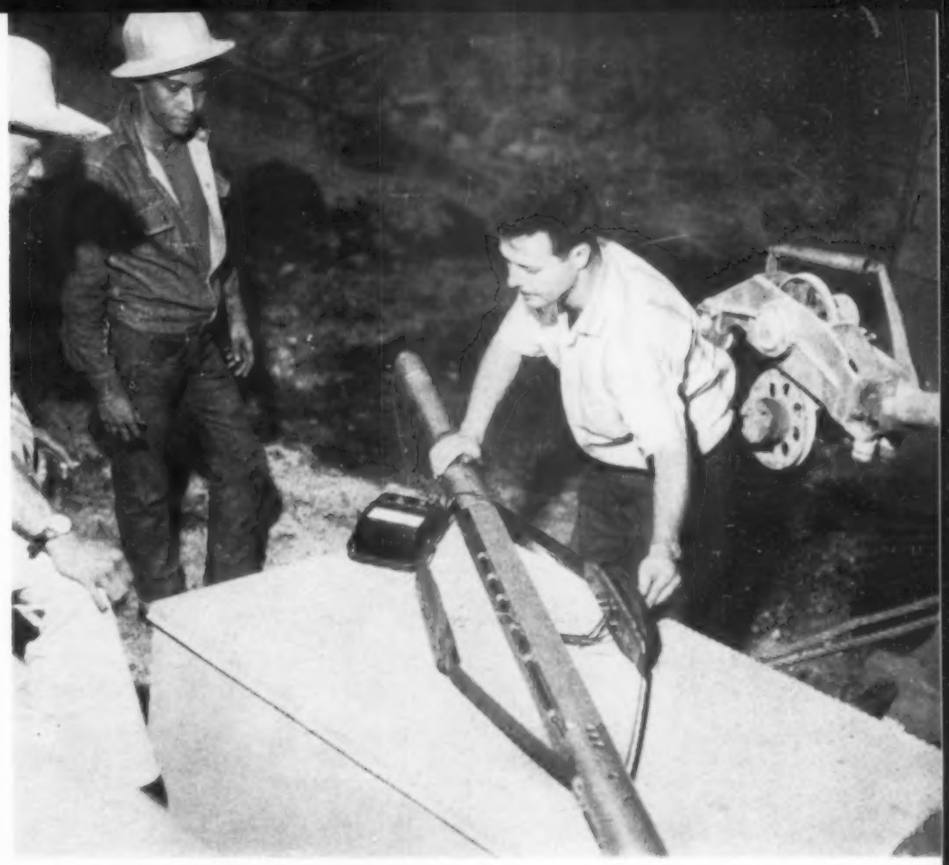
Leyte: Late in May, continuing and into June 1958, PODEO began a structure-hole program and a seismic program on its concession No. 5 at the north end of Cebu, where a broad attractive anticline is exposed. A deep test may be drilled here. Adjoining this PODCO concession on the south is the Luzon Stevedoring-White Eagle Overseas concession No. 3 where a considerable asphalt deposit is exposed; this deposit has been mined commercially for a number of years.

Bohol: REDECO has a solely-owned concession on the western side of this island; also an adjoining concession covering the southwestern tip of the island in which San Jose has an option to acquire a 50% interest. Both REDECO and San Jose have performed geological, ground magnetometer, and gravity surveys.

Bondoc Peninsula, southern Luzon Island: No new drilling is immediately in sight for this area. However, several concessionaires—notably REDECO, White Eagle, and Acoje—have geological parties working there.

Shallow occurrences of light oil in much of this peninsula have been known for many years, and it has experienced more drilling attempts than any other area of the Philippines—all ending in failure because of caving hole in thick Miocene siltstones, somewhat similar to the recent experience in the Cayagan basin. Some of the shallow holes drilled or dug by hand to depths of 100 ft to 328 ft, in the interval 1906 to 1919, actually pumped light-gravity oil ranging from a few gallons up to two barrels per day. In the interval 1921 to 1924, Richmond Petroleum Co. drilled four well in Bondoc to depths of 610, 1,318, 3,752 and 5,103 ft; all of these holes had caving difficulty. The three deeper holes reported small oil shows.

In the interval 1938-40, Far East Oil Development Co., the predecessor of PODCO, drilled five shallow wells along the axis of the Molave anticline; all were abandoned in the range of 450 ft to 1,050 ft because of caving. Many small oil shows were logged. During 1948-49, PODCO attempted to drill another hole which, after starting and relocating for the third time, penetrated to 5,548 ft where it was abandoned because of caving difficulties; as in the other holes, gas and oil shows were logged.



Jean Lador, Schlumberger engineer, prepares to run electric log in Acoje's Libertad No. 1.

Ipil No. 1, the Stanvac wildcat in the south end of the Cagayan basin in northeastern Luzon, is reportedly testing approximately seven million cubic feet of wet gas per day from a limestone section. This is the first promising petroleum strike in the Philippines. The well, drilling of which began on June 7, 1958, was completed in August at about 7,260 ft. Stanvac has begun seismic work to provide locations for stepouts from the discovery. Abaca 1 has begun drilling 60 miles south.

On October 15, Philippine Oil Development Co. (PODCO) started a 6,000-ft to 8,000-ft test in northwestern Leyte on a north-south trending anticline. The objective is a thick porous basal Miocene sandstone section, which in outcrop some 15 kilometers distant from the site, is reported to show an oil seepage. Geologists in the area consider this test highly important, and its results will be watched with great interest.

The adjoining concession on the south, owned by White Eagle Overseas Oil Co., exposes in a separate anticline an asphalt deposit which has been commercially mined for many years. This deposit occurs in Miocene sandstones which are believed to correlate with the sandstone objective in the PODCO test.

Near the west coast of Cebu, Republic Resources & Development Corp. (REDECO) reports that its 1,500-ft core-drill test has shown a number of small oil and gas shows. This test is in the neighborhood of eight shallow holes up to about 1,000 ft deep, drilling the period between 1898 and 1935—all of which showed light oil of 42 to 43 API gravity. One of these old holes has been producing an average of about 1 b/d for many years. REDECO is cleaning out another hole; based on the hourly rate of oil entry, the REDECO management believes it will be able to recognize it as a 20 b/d pumper.

Summary: A considerable amount of costly geological and geophysical exploration of good quality is in progress, with a greater volume planned for the future. One deep test was drilled during the latter half of 1958 by Stanvac in Cayagan and a second is planned; it is probable that PODCO, Acoje, and REDECO will each drill tests in the range of 5,000 ft to 10,000 ft on Leyte (or Panay), Cebu, and Mindero; Caltex may drill in 1959. San Jose's exploration must complete its current 18-months gravity programs and approximately 12 months of seismic survey to provide drilling location.

Respecting the quality of the current work, the geological teams of Stanvac, Caltex, and San Jose are headed and supervised by experienced USA geologists; the several Filipino teams each of PODCO, REDECO, Acoje, and Maremco are supervised by at least one experienced USA field geologist per company. The geophysical parties in use have been contracted from well-known USA contractors. The drilling rig used by Stanvac is contracted from and operated by Santa Fe Drilling Co. under supervision by Stanvac's exploration department. PODCO had many years of drilling, and has developed much know-how in using its own rig. Acoje has excellent equipment, and uses USA drillers in its organization. END

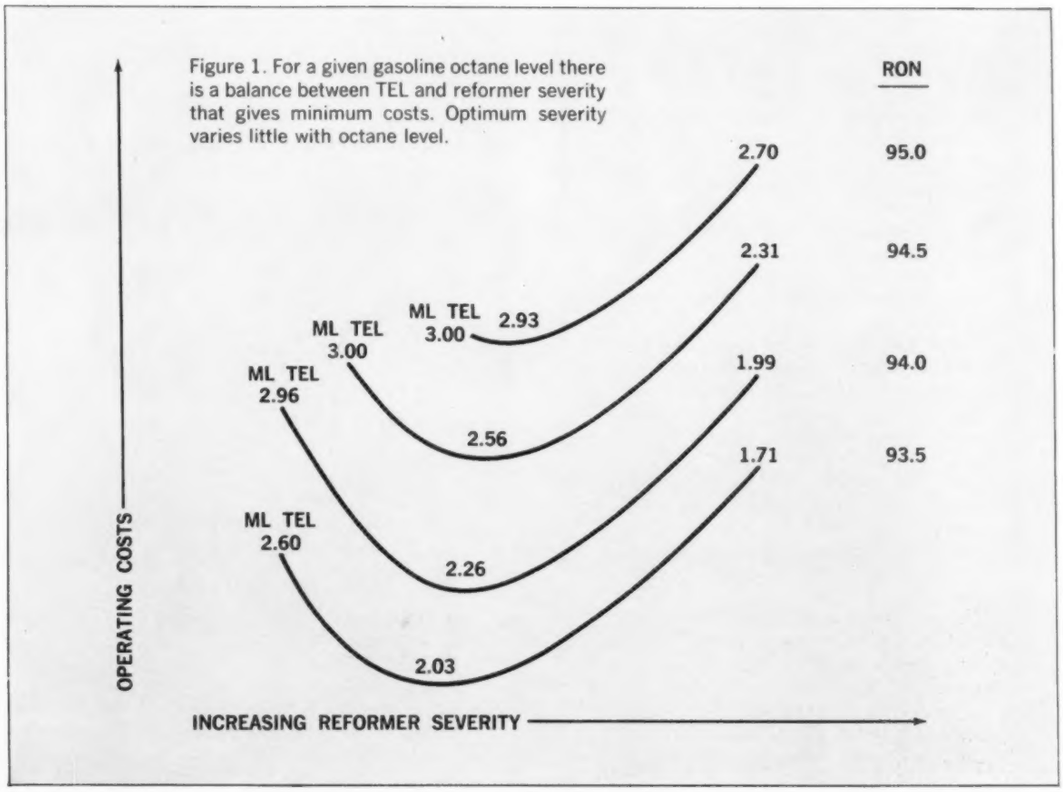


Figure 1. For a given gasoline octane level there is a balance between TEL and reformer severity that gives minimum costs. Optimum severity varies little with octane level.

Ethyl Research Studies Effect of Reduced Charge Rate on Octane-Improvement Costs

ECONOMICS of octane improvement are continually under study in the Detroit Laboratories of Ethyl Corporation. Such studies provide a broad background for solving the specific problems of refiners and also in achieving minimum octane costs.

This work is of particular interest now when the refining industry is operating at lower percentage of capacity. In the light of today's reduced charge rates, the Ethyl Corporation investigations show that refiners can realize substantial savings by re-examining their refining operations carefully.

Using rigorous economic analysis, refiners can define the balance between the cost of tetraethyllead and that of octane-improvement processes for a required gasoline pool. Analysis can also define the optimum allocation of tetraethyllead among the various grades of gasolines to be produced from the pool of components.

Tetraethyllead vs. Catalytic Reforming

In catalytic reforming and tetraethyllead the refiner has two means of octane number control. By increasing reforming severity, he increases octane number at the expense of gasoline yield. With tetraethyllead, he increases octane number at the expense of higher concentrations.

There is a definite balance between reforming severity and tetraethyllead concentration that results in minimum cost for any set of conditions.

Figure 1 is a typical plot of cost versus reformer severity for different Research octane number levels. Tetraethyllead concentrations are indicated on the cost curves. They decrease as severity is increased, and the optimum tetraethyllead is defined by the point of minimum cost. As octane number is increased, optimum tetraethyllead rapidly approaches maximum concentration. At the same time, reformer severity increases very little. Figure 1 is representative of many refining situations today.

Octanes Influenced by Crude Charge Rate

The refining industry is operating at a significantly lower per cent of capacity today than it was a year ago. This affects pool octane quality. At reduced crude runs, catalytically cracked gasoline makes up a bigger part of the gasoline pool

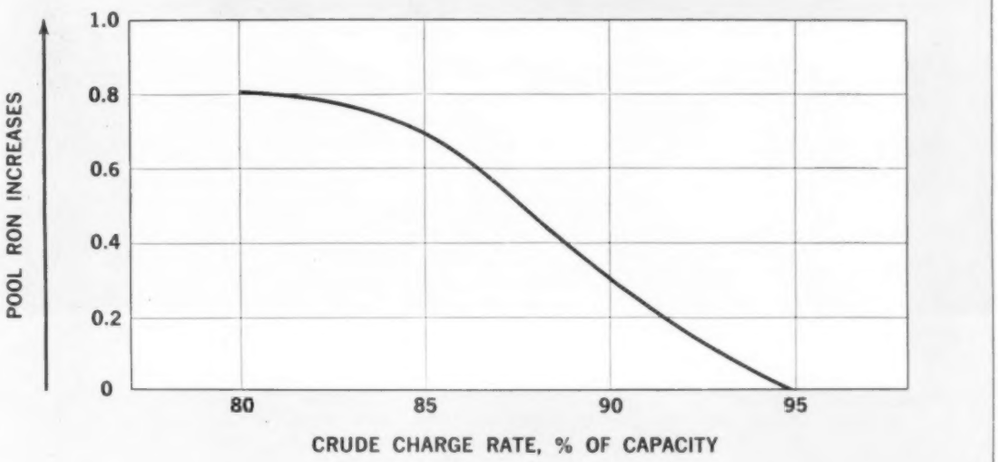


Figure 2. Effect of Crude Charge Rate on Pool Octane Number.

and pool octane quality may be higher.

Also, catalytic reforming capacity, as a function of crude run, is higher which enables a larger percentage of naphtha to be upgraded. Refiners must consider the effects that this stiuation has on their present and planned operations.

Figure 2 illustrates the effect that crude charge rate may have on the RON quality of a gasoline pool. A decrease in the percentage of crude running capacity in operation raises the pool octane number. This effect can be as much as 0.5 to 1.0 octane numbers.

Operations Today are Less Severe than Last Year

At present, relative to a year ago, reforming severity and tetraethyllead in the average refinery have undoubtedly shifted as a result of several factors. The higher ratio of cat cracking capacity and reforming capacity to crude runs enables refiners to produce a given octane quality with less severe operations.

Therefore, in order to make the best use of tetraethyllead and reforming for octane improvement, the balance between reforming and tetraethyllead must be frequently reviewed and studied.

Directionally, at lower percentages of capacity operated, reformer severity should be somewhat less (higher reformate yield) in order to get the most efficient use out of tetraethyllead. The curves shown in Figure 1 would shift to the left under these conditions.

Ethyl Research is constantly testing all of the variables which affect the use of tetraethyllead and the cost of octane-improvements. Results obtained are passed along to the Oil Industry to help individual oil companies achieve optimum production economy.

How Ethyl Research is helping you

Our Refinery Technology staff, backed up by the extensive facilities of the Detroit Laboratories, will be glad to share their experience with your economics people when you conduct an analysis of your octane-improvement costs.

For further information, call your Ethyl Representative. He will be glad to arrange an appointment for you with one of our Refinery Technologists.

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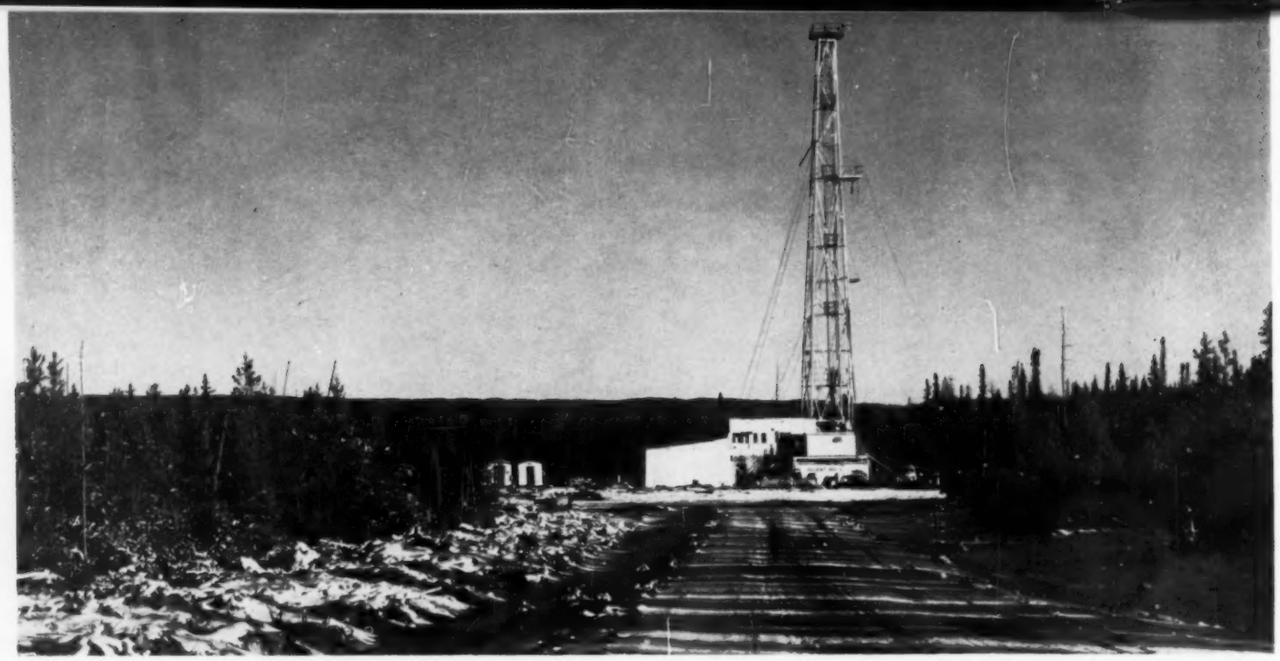


Drilling Hudson's Bay-Home-Union Virginia Hills well 10-21.

Swan Hills find boosts Canada's reserves

by Alex Clark

ALEX CLARK, of Home Oil Co. Ltd., was born in Great Falls, Mont., in 1902. He was graduated by Whittier College in 1926, with a B.A. degree in mathematics and physics. He obtained his B.S. in geology in 1928, and his M.S. in 1932, from California Institute of Technology. From 1929 to 1952, Mr. Clark held various geological and exploration positions with Shell Oil Co. He joined the Home-Federated group as vice president and a director in 1952.

Discovery of commercial oil in the Virginia Hills-Swan Hills area of northern Alberta ranks among the most important in Canada. It opened a new producing formation and boosted reserves of the discovery company, Home Oil, by 80 million proved recoverable barrels, plus 300 million barrels of probable recoverable oil.

EARLY in 1957, the oil industry's attention was directed to a wilderness area some 125 miles northwest of Edmonton, as a result of two oil discoveries—one, the Home Oil Co. 9-20 well in the Virginia Hills area; and the other, the Home 8-11 well in the Swan Hills block. These two discoveries, 25 miles apart, also directed attention to a producing horizon in the Devonian, the Slave Point reef which had hitherto not yielded commercial oil or gas. Immediately following these discoveries, Mobil Oil Co. discovered gas and distillate in the same formation a few miles to the south. A few weeks later, Phillips discovered oil in the same formation, 40 miles to the west, in an area which is now known as the Kaybob oil field. Shortly thereafter, Home scored another discovery in its 11-19 well, six miles southwest of the first Swan Hills well.

Subsequent outstep drilling has indicated the existence of an important oil reserve on the Swan Hills block, but the ultimate outlines of the producing area have not yet been determined. Preliminary estimates indicate the presence in this field of 80 million barrels of proved recoverable oil, plus an additional 300 million barrels of probable recoverable reserves. At Virginia Hills, a one-mile easterly stepout failed to find production due to absence of porous reef, but a one-mile southwesterly stepout was a producer. A great deal of additional drilling must be done surrounding the Virginia Hills producers before the size or significance of the discovery can be determined.

The Virginia Hills-Swan Hills area is a wilderness of hills, muskeg, and heavy timber. Topographic relief from the higher hills to the stream valleys is 2,000 ft. and the maximum elevations reach almost 4,000 ft. Such terrain presents difficult operational problems. Road building and location clearing are unusually expensive because of the

heavy timber and rugged terrain. As the hills lie nearly 2,000 ft above the surrounding plains area, the rainfall here is much greater than in the lower elevations. Consequently, operations are at present confined to about four months during the winter season, when the ground is frozen. Until an all-weather road can be completed into the area, these operations will continue to be interruptible during the summer months.

Prior to 1957, little or no drilling had been carried out in a huge area involving more than 60 townships. Most of this area, including the Virginia Hills and Swan Hills blocks, is included in the Virginia Hills Provincial Petroleum Reservation, comprising 56 townships, which was set up by the Alberta government in 1941. These reserve areas are not available for filing in the ordinary manner, but must be posted for sealed bidding at crown sales.

In 1953 and 1954, a number of four-township parcels containing 92,160 acres each were requested for bidding, and several oil companies purchased these blocks at prices varying from $115,000 to $1,800,000 per parcel. In July 1957, after the oil discoveries, two four-township blocks adjoining sold for $2,300,000 and $3,350,000. At the most recent sale, in April 1958, the remaining land in the petroleum reserve was sold.

Surveying right-of-way for the Swan Hills field. (All photos in this article, courtesy of Home Oil Co. Ltd.).

Drilling Regent "A" Swan Hills well 4-20-67-10.

Home and associates paid $6,500,000 for a 92,160-acre parcel comprising Townships 65 and 66, Ranges 8 and 9, lying immediately southeast of the Swan Hills block. Interest is split 40% to Home Oil Co., 40% to French Petroleum Co., 15% to Kern County Land Co., and 5% to United Oils Ltd.

In Alberta, the petroleum and natural-gas reservations issued by the provincial government have exploration requirements. In addition, if an oil or gas discovery is made, and in any case after a certain number of years, the owner of the reservation must go to lease on half of the area in lease blocks of not more than nine sections. The intervening land is returned to the government and becomes crown reserve, which can be posted for sale at any subsequent time. In the Swan Hills block, Home and associates took out a lease on nine sections surrounding the five oil wells thus far completed. In early 1958, the government posted eight half-section parcels for sealed bid. Home and associates, in April 1958, purchased five of these half-section parcels on the north and east sides adjoining the nine-section lease block for over $3,400,000. Ultimately it will be necessary to go to lease on not more than one-half the land in the whole four-township reservation; and the Alberta government will be able to sell, at sealed-bid auction, the remaining half of the land.

Of the three wells thus far completed in the Swan Hills field, the best well is the 11-19 well which was completed for an initial 55 bbl per hour through a 24/64-in. choke. The gravity of the oil is 41.7 API, and the gas-oil ratio varies from 550 to 560 cu ft per bbl. The well produced at a rate of 700 b/d for several weeks prior to spring breakup. Due to variations in the reef buildup, the net pay thickness varies rather widely among the seven wells drilled through the Slave Point. Net pay thickness varies from 35 ft in the 10-13 well, to a maximum of 155 ft in the 10-10 well. Porosity of this net pay thickness averages 9%. The average depth of the pay horizon is 8,300 ft. No gas cap or oil water interface has been encountered thus far in the field. In view of the undersaturated nature of the oil in wells completed to date, it seems unlikely a gas cap is present in the reservoir. On the basis of the producing behavior of the wells, it is suspected water is present at some distance downdip from the field.

The discovery well in the Virginia Hills field, 9-20, penetrated a net oil pay of 38 ft. Additional porous reef was present, but was below the oil-water interface. The well was completed for 865 b/d of 39 API oil, through a 20/64-in. choke. The 4-20 well encountered 42 ft of net pay above the water. The 10-21 dry hole penetrated reef material, but no porosity was encountered. The depth through the Slave Point pay averaged 9,300 ft.

The term "Slave Point" has been used to designate the reef member lying within the Beaverhill Lake argillaceous limestone of Upper Devonian age. The latter formation immediately underlies the Woodbend formation, also of Upper Devonian age, which contains the Leduc (D-3) reef. The Leduc reef, unlike the Slave Point reef, is enclosed in shale. Although the Woodbend formation is present in the Swan Hills-Virginia Hills area, no reefing has been encountered.

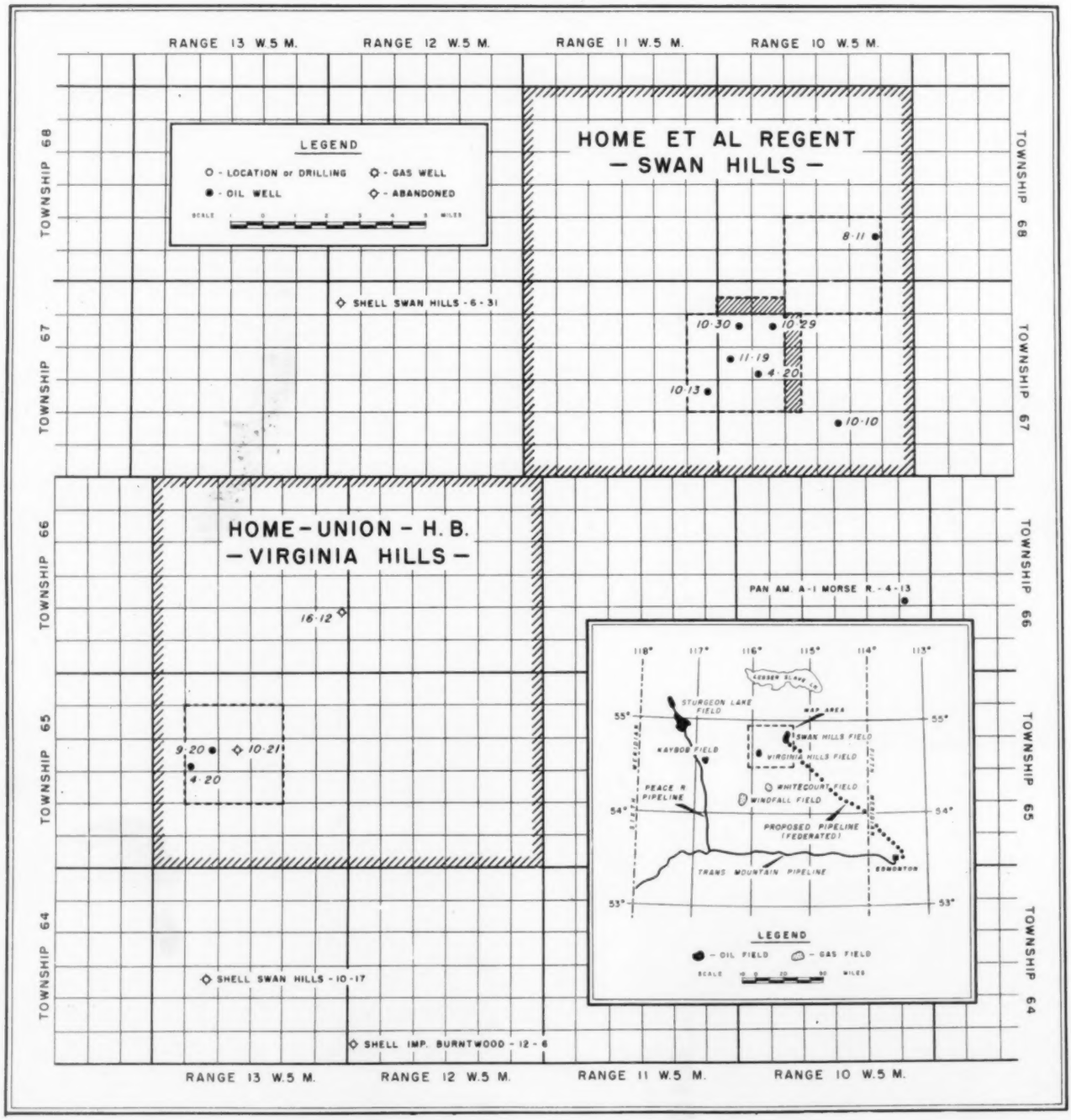
Within the area under discussion, the Slave Point varies from a thin basal reefoid member to a thick body replacing a large part of the Beaverhill Lake argillaceous limestone. Gross thickness varies from 140 ft to 355 ft. Most of this reef mass is bioclastic—ranging in size from silt, through sand to medium conglomerate, usually rather poorly sorted. The most common fossils in the reef mass are Stromatoporoids and Amphipora. The lower portion of the Slave Point is comprised largely of nonporous limestone, with occasional thin porous reefoid limestone.

The Beaverhill Lake formation dips regularly south 45 deg west at a rate of about

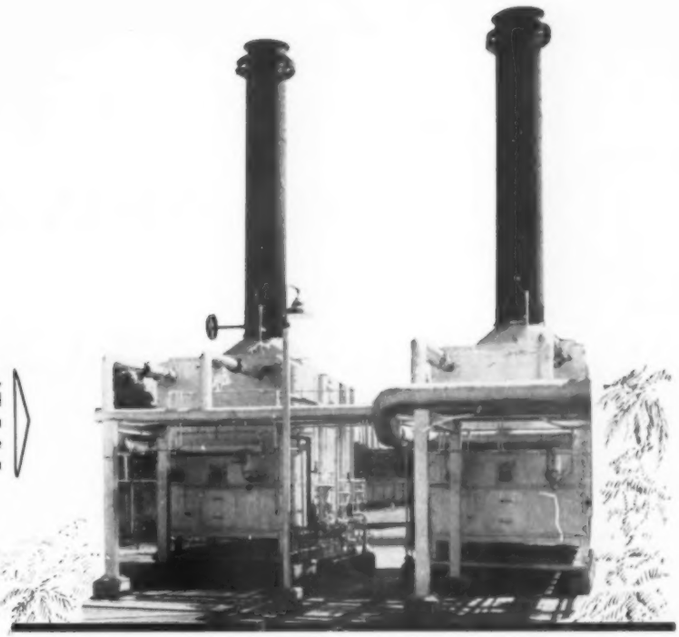
Base camp at Swan Hills.

40 ft per mile across the area. As the reef material is enclosed in limestone, no "draping" occurs at the top of the Beaverhill Lake, as is the case of beds overlying the Leduc reef buildups which are enclosed in shale. Compaction of the surrounding shales accounts for the folding or "draping" in the overlying beds. Insufficient drilling has thus far occurred to permit a full understanding of the pattern of reefing, or the reasons for its location. It is reasonable to infer from present control ,that the reef masses are irregular in outline and in thickness. Reflection seismic surveys of the area have been utilized in a qualitative way in locating the reef buildups. Undoubtedly they will become more useful in locating future exploratory wells in the area as more geological control refines the seismic data.

A small amount of oil production from the Virginia Hills and Swan Hills fields has been trucked and shipped by rail to a small refinery in Grande Prairie, approximately 100 miles west of the area. The Kaybob field is connected by a lateral to the Peace River pipeline which serves the Sturgeon Lake field. Consideration was given to building an extension from the Swan Hills-Virginia Hills fields westward to connect with the Peace River pipeline. However, a more flexible route connecting the Virginia and Swan Hills fields directly to Edmonton was decided. Home Oil Co. and associates now have a permit to build a 10¾-in. 130-mile pipeline from Swan Hills to Edmonton at an estimated cost of $6½ million. It is believed that completion of this project will occur, under favorable weather conditions, by late November 1958. END



Born prefabricated, preassembled heaters in a natural gasoline plant in Venezuela



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REVIEW OF WORLD OIL LAW AND CONCESSION CHANGES IN 1958

PART II — EUROPE

Europe is changing its oil laws to conform to modern needs, as covered in this article, the second in a series, on changes in world oil laws during 1958. A previous article covered Latin America. Succeeding ones will cover other major geographical areas.

SEVERAL outstanding changes have occurred in Europe since the beginning of 1958. The French, who recently codified their oil regulation, are devising a code for the Sahara which will replace the confusing legal setup now existing. The oil companies now operating, including the American ones, do so more on the basis of special contracts than exisiting legislation. They have been assured the terms of the new "Sahara Law" will not be more onerous than the existing Metropolitan French law which is essentially what their contracts consist of at present.

ALGERIA

Sahara Law Awaited: The new oil code for the Sahara consists of nine chapters and 118 articles, according to unconfirmed reports, and is based on 50-50 profits division. Exploration concessions have a five-year duration; exploitation concessions have a maximum 50-year duration. The Organization Commune des Regions Sahariennes, a government agency, will receive oil payments.

Royalty on crude produced is 12½%, which is a good feature since it is deductible from USA taxes. Royalty on gas is 5%. The usual "cahier des charges" has been replaced by a convention which gives the concession an appearance more of a private contract. Arbitration is provided for rather than settlement by government tribunal, as in France. Until the final text appears, which will probably be before the end of 1958, full details on the law cannot be known; however, the fiscal side appears stabilized by assurance that payment terms will not be changed during the life of the concession. Such terms consist mainly of the 12½% royalty plus a direct tax bringing the total to 50% of profits. A depletion allowance is reportedly contained. Assurance of convertibility and transfer and repatriation of profits are guaranteed, according to unofficial sources.

AUSTRIA

Austrian Settlement Near? Settlement of the *Vienna Memorandum* controversy between the government and Shell-Mobil Oil companies may be reached via a company proposal of late April. The companies propose a 50-50 partnership with the government's OMV through RAG, their jointly owned subsidiary, over the Matzen area, as well as Hollabrunn and concession areas in the southern Vienna basin; in Burgenland province, and in areas adjoining RAG's present concessions in Lower Austria (all of which were included in a government proposal of December 1957) plus the Laa area and RAG's present concession areas in Styria and upper Austria.

ITALY

Italy Considers Offshore Law: Italy, which after a bitter fight of many years' duration passed a new petroleum law for the mainland in 1957, has still not succeeded in passing regulations to it. The companies exploring there now [there are only two large American companies represented, Cities Service and Pan American International Oil Co., subsidiary of Standard Oil Co. (Indiana)] do so by receiving interpretation of the 1957 law as they go along. Gulf had pulled out of the country shortly before the law was passed for a number of reasons, but cited its opposition to the law as the principal one.

Now a new offshore law is pending, and so is a draft law reducing the government's oil entity, ENI, grip on the mainland. The outcome of the Italian elections makes it extremely unlikely this draft legislation providing for an eventual 50% reduction of the area of northern Italy (Po Valley) (in which at present the State has a monopoly through ENI) will be modified.

An offshore draft law which contains more favorable terms than the present onshore law of 1957 is due to come up before parliament for consideration, however.

GREECE

Greece To Pass New Oil Law: A new bill for regulation in Greece is being considered at present, and reportedly has been considered by a parliamentary committee. Details of the bill are not yet complete; those known at present are as follows: *Exploration:* Maximum area: 250,000 acres. Duration of concession, two years, with two years' extension at company's option. Drilling obligation 3,000 ft during the first two years, additional 12,000 ft for the 2-year extension. *Exploitation:* Duration 30 years, with 10-year extension at operator's option. Fiscal provisions: Government's profit share based on varying minimum percentages of annual production, ranging from 2% for production below 1,500 tons per year (about 30 b/d) up to 30% on production of 150,000 tons yearly (about 3,000 b/d).

There is no oil legislation in Greece at present, all concessions having been obtained through competitive bids. Overtones of this system remain in that the fiscal provisions outlined here are only a minimum, with rights to be granted to those companies whose bids most exceed the minimums.

MALTA

Malta Grants BP Concession: The new British Petroleum Co. concession over the entire island reportedly has a 50-50 profits-split basis. A new tax law may be necessary to put it into effect, however. The new concession was granted British Petroleum March 24, 1958. It contains a three-year exploration period, with extensions of two years if obligations have been met. It covers the entire island of Malta and its dependent islands, but must be reduced to 50% of its original area at the end of three-year initial term and to 25% of its original size after five years. The concession may be surrendered at any time.

SPAIN

Spain to Have New Oil Law: Increasing interest in possibilities of finding oil have led Spain to provide a separate petroleum law. The new law is presently in draft form, has been approved by the executive, and is now being considered by the Cortes. No fundamental changes are expected to be made by the Cortes, which published the draft law in the *Boletin Oficial No. 596*. The State monopoly over exploration acreage not granted before 1952 has been extended through December 1958.

Operations under the draft divide into exploration and exploitation concessions. Provisions for refining, storage, and transportation permits are also included. Exploitation concessions are limited to half the exploration area. Exploration concessions are grantable to persons or companies possessing acceptable technical and economic means. There is no limitation on the participation of foreign capital. Companies financially dependent on foreign governments are excluded.

State participation in profits is 50%, including all direct and indirect taxes. The concessionaire will pay a royalty in kind or in cash, which is nonreturnable even if the developer suffers a loss. Exports may be made only after internal demands has been satisfied. Depletion allowance is given (amount not stated in summary available at this time).

Areas subject to the law include (a) peninsula Spain, the Baleric Islands, the Canary Islands; (b) territories of Spanish Guinea and of Spanish West Africa. In all these areas the law also applies to the continental shelf and territorial waters thereof. Exploration surface tax per hectare (2.47 acres) is: During initial term, 1 peseta; during first extension, 2 pesetas; during second extension, 4 pesetas.

Annual exploitation surface tax is payable per hectare as follows: First five years . . . 0.80 gold pesetas. Following five years and thereafter to end of concessions . . . 2.40 gold pesetas.

Provisions are also contained for specifying the maximum size of State reserves and a time limit within which they must be defined. Regulations are also contained on the activities of the government's National Industrial Institute (INI) giving a period within which the INI companies now exploring must request correction and modification of their present concession.

Apart from the new oil law, the first revision of Spain's internal monopoly over distribution within the country in many years occurred in August. New regulations governing the sale and supply of oil products were promulgated in the *Boletin Oficial* of August 7, 1958. The objective is to increase the number of filling stations serving Spain's increasing vehicle population, and a significant change is made in transferring much of this to private hands and away from the State's monopoly, CAMPSA. Provision is made for construction of filling stations with private participation; and where formerly such "mixed" stations reverted to the State in 40 years, they now revert in 40, 65, or 75 years depending on whether they are 1st, 2nd, or 3rd class. Also, at the end of such period, the private operator can continue, on payment of a tax, to operate the station.

SWITZERLAND

Switzerland Seeks Federal Control: The federal government has sent a circular letter to all cantonal governments and to various other entities announcing proposals for a constitutional amendment which would give the federal authorities supervisory powers over the cantons in all matters concerning the exploration for, and production of, crude oil and natural gas and the refining and export of locally produced oil and gas. The amendment would entitle the federal authorities to pass an outline law regulating the grant of concessions by the cantons, while in certain specified circumstances the federal authorities would be allowed to grant such concessions themselves. The federal government would also be authorized to levy taxes on indigenous oil and gas, which would correspond to the present customs duties on imports.

The Central Concordent agreement for unified treatment of concessionaires within the areas of Bern, Lucerne, and Solothurn, dated October 21, 1957, has not yet been finalized.

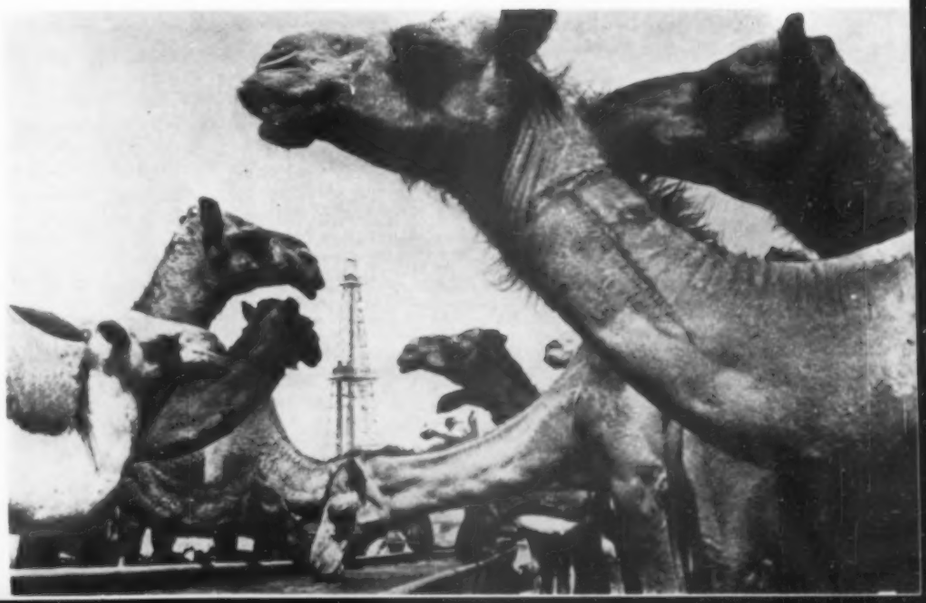
The canton of Fribourg has issued new regulations to its Mining Law of 4/10/1850. The new regulations, known as "Réglement d'Execution de la Loi du 4/10/1850 sur l'Exploitation des Mines et Carrières, En Vue de la Réchèrche et de l'Exploitation des Hydrocarbures," are designed principally for petroleum regulation.

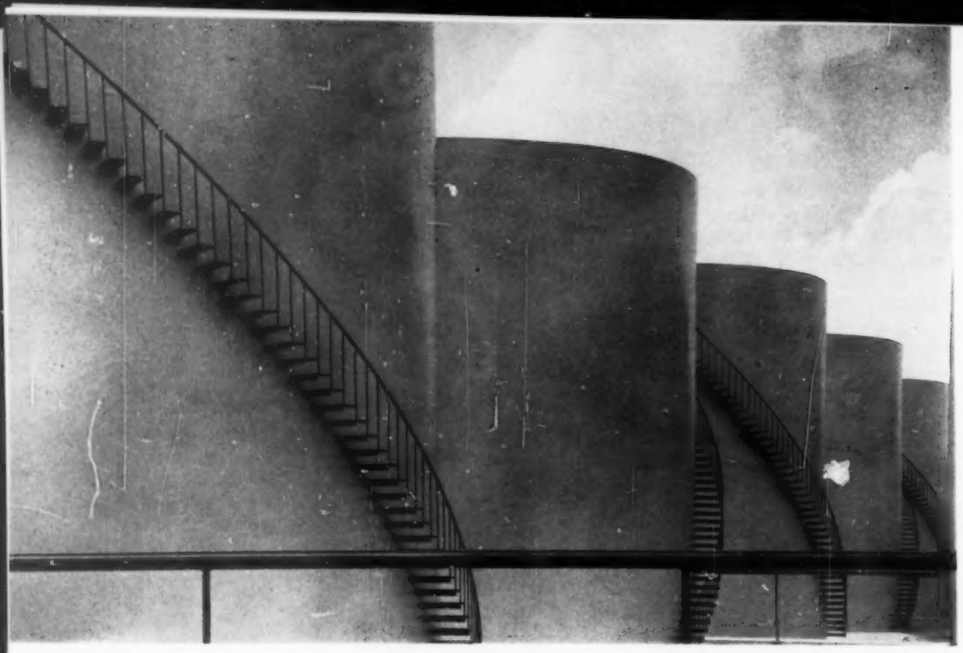
UNITED KINGDOM

United Kingdom Offshore Law: The Oil in Navigable Waters (Exceptions and Exemptions) Regulations, 1958, has been published as S.I. 1958 No. 1060. It came into operation on July 26, and re-enacts with amendments the Oil in Navigable Waters (Exceptions and Exemptions) Regulations, 1956.

END

Source material for this article is taken from *World Petroleum Legislation Report*, a monthly news letter on oil law changes and concession developments published by Mona Palmer Publishing Corp., 604 Fifth Avenue, New York 20, N.Y.





Oil now largest USA investment abroad

USA companies are investing ever-increasing amounts outside their home country. Their investment abroad has now shot up to first place, almost $9 billion, far ahead of any other U.S. industry. Significantly, much of it was by smaller companies who, lacking marketing facilities, must import into the USA.

by Dillard Spriggs

INVESTMENTS by USA oil companies in foreign countries are being increased more rapidly than ever before. This expansion reflects the major efforts exerted by a wide variety of companies, many of which have only recently ventured outside the United States for the first time to find new sources of oil abroad. The increase also results from the continuing need of those firms which have long participated in international operations to expand existing producing, refining, distribution, and transportation facilities. The greatest part of the increase in the size of investment abroad during recent years has taken place in the Western Hemisphere, principally in Venezuela and Canada. The expanded flow of new investment into these countries carries relevance for the future evolution of USA oil imports. As this investment bears fruit, the availability of oil looking for markets in the United States is bound to increase. The diversification of the proprietors of international investment—a development which has accompanied the recent expansion—will also affect USA import trade as well as the structure of the international oil trade in general.

Growth of Investment is High: The book value of direct investment by USA oil companies in all branches of the industry in other countries amounted to $8,981 million at the end of 1957, according to the latest data made available by the US Department of Commerce. At this level, petroleum investment was about $1.0 billion greater than investment abroad by American manufacturing concerns, the second most important category of American investment abroad. Only two years earlier, at the end of 1955, manufacturing had outranked petroleum by $530 million. In this connection, it should also be noted that book-value figures tend to obscure the total amount of investments made outside the United States by USA oil firms. Book-value data, for example, are considerably smaller than the total capital expenditures carried by USA oil companies operating overseas. A large part of these expenditures is financed out of charges against income, such as depreciation allowances; but neither these expenditures nor those financed by borrowing or equity financing in foreign capital markets are included in the book value of investment as reported by the Department of Commerce.

The shift toward petroleum as the largest USA investment abroad reflects the unprecedented growth which has occurred in the stake which American oil companies have acquired overseas. The book value of their investment at the beginning of this year was as much as $1,701 million higher

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than a year earlier—a gain which appears all the more noteworthy when it is considered it was superimposed on an advance of $1,441 million made in 1956. The increase for the two-year period ($3,141 million) was thus about as great as total petroleum investment abroad had been as recently as 1950 (see Table I).

Investment Highest in Western Hemisphere: The expansion has been greatest in the Western Hemisphere. The most pronounced gains were made in Venezuela, where the book value of investment has doubled in the past two years to approximately $2,200 million. For some time prior to this increase, investment in Venezuela had experienced a relatively long period of only modest growth. In fact, the increase in 1957 alone—$768 million—was greater than the total increase registered in the preceding six years. The reasons for this upsurge may, of course, be traced to the investments made by many companies on the new concessions granted by Venezuelan authorities in 1956 and 1957. Large cash bonuses were paid for many of the concessions, and most companies began to make sizable investments in exploration and drilling during 1957.

This increase in Venezuelan investment by three-quarters of one billion dollars marked the first time in several years that investment in Canada had been overshadowed by any other country. In each of the years between 1950 and 1955, investment in Canada by USA oil interests had increased faster than anywhere else, averaging about $200 million. However, investment in Canada did accelerate in 1956 and 1957, showing increases of more than $400 million in each year.

Between the two of them, Venezuela and Canada now account for over 60% of total investment by American oil companies abroad. If other areas in the Western Hemisphere are included, the share of this hemisphere in the total rises to more than two-thirds

Changes in investment in major Eastern Hemisphere areas appear limited, although significant, against the very large expansion in Venezuela and Canada. Investment in western Europe rose about $180 million during 1957, mostly as a result of a sharp increase in refining construction in the United Kingdom. Information covering the Middle East does not permit a complete analysis of investment changes because of the geographical classifications employed by the Department of Commerce. The shiekhdoms of Kuwait, Bahrein, and Qatar are grouped with a variety of other areas in the classification of western European dependencies; total investment by oil companies in this group increased by about $65 million during 1957, most of it undoubtedly relating to investment in the sheikhdoms. The independent oil-producing countries in the Middle East—Saudi Arabia, Iraq, and Iran—are included in "Other Asia and Africa" with a number of other countries; the total oil investment in this group rose by $42 million last year.

The size of the expansion in the Middle East area reflects the fact that major investments in the region were made early in the postwar period when the oil resources of the area, and all ancillary facilities such as housing, transportation, etc., were developed extensively. Investment requirements in the Middle East oil-producing area are also affected by the fact that production costs tend lower than in most other oil-producing regions.

Investment and Trade Depend on Oil: This large and growing investment supports a vast complex of oil operations abroad by American oil companies. Crude-oil production alone by USA firms outside the United States was about 4,300,000 b/d in 1957. The vast bulk of this production moves in international trade from the countries where it is produced to markets throughout the world. And roughly one-quarter of the total, say, 1,000,000 b/d, is imported into the United States. The recent major expansion in investment abroad would appear to provide the basis not only for increased trade overseas by American companies, but also for greater USA import business.

In this connection, it is significant that Venezuela, the single most important source of oil imports into the United States, has accounted for the major part of the recent growth in investment. Moreover, much of the new investment has been injected into the Venezuelan industry by a variety of small and medium-sized independent American oil companies. Hardly any of these firms possess important distribution facilities in foreign markets in which they can sell production they establish in Venezuela. Accordingly, these companies are inclined to look to their home market as the place to dispose of their oil and thus earn a return on their investment.

Earnings on Investment High: The total profits earned on investments in all areas amounted to $1,623 million in 1957, and were thus equivalent to about 18% of total investment (see Table II). Earnings in Canada were $95 million in 1957, equivalent to only about 4% of investment. This low ratio, the smallest of any major country, reflects the fact that Canadian oil is still in the relatively early stages of its development when capital requirements are high.

In the more mature producing area of Venezuela, earnings are much more substantial on an investment of approximately the same size. At $613 million in 1957, earnings in Venezuela were equal to 29.5% of the book value of investment. In the regions which include the Middle East oil-producing areas—i.e., western European dependencies in the Eastern Hemisphere and "other Asia and Africa"—earnings also represent a substantial share (approximately 35%) of the book value of investment.

In most other countries outside the major oil-producing regions, earnings constitute a much smaller percentage of investment. A significant exception is the United Kingdom: although investment in Britain is concentrated on refining and transportation equipment, earnings in 1957 were equivalent to 28% of investment. In the remainder of Europe, the ratio was only about 7%.

In conclusion, it may be noted that the call on the industry's earnings as a means of financing new investments is always pronounced. In years like 1957 and 1956, when new investment was increased sharply, the need to re-invest a high proportion of earnings was obviously very great. Indeed, requirements were so high and investments were undertaken by such a large number of new firms that, as indicated by the Department of Commerce, large funds of new capital as well as earnings had to be injected into the foreign oil economy by USA oil companies. END

TABLE I

BOOK VALUE OF DIRECT INVESTMENT IN FOREIGN COUNTRIES BY U.S. OIL COMPANIES AT END OF YEAR
(Millions of Dollars)

	1957	1956	1950
TOTAL ALL AREAS	8,981	7,280	3,390
WESTERN HEMISPHERE:	5,505	4,181	1,826[e]
Canada	2,154	1,768	418
Latin America	3,161	2,232	1,408
Venezuela	2,179	1,411	857
Other L. America	982	821	551
W. European Dependencies[a]	190	181	[e]
EASTERN HEMISPHERE:	3,477	3,099	1,564[e]
Western Europe	1,184	992	424
United Kingdom	394	279	123
Other Europe	790	713	301
W. European Dependencies[b]	454	389	296[e]
Africa and Asia	1,839	1,718	844
Liberia	296	263	68
Union of S. Africa	57	69	45
Indonesia & Major Far East Countries[c]	532	474	204
Other[d]	954	912	527

Note: Details may not add to totals because of rounding.
[a] Includes mainly Netherlands West Indies and Trinidad.
[b] Includes Kuwait, Bahrein and Qatar.
[c] Includes India, Philippines, Japan, Australia and New Zealand.
[d] Includes Saudi Arabia, Iraq and Iran.
[e] Data for W. European dependencies in the Western Hemisphere not reported separately and are included with Eastern Hemisphere.
SOURCE: U.S. Department of Commerce

TABLE II

NET EARNINGS OF U.S. OIL COMPANIES FROM FOREIGN OPERATIONS
(Millions of Dollars)

	1957	1956	1950
TOTAL WORLD	1,623	1,406	627
WESTERN HEMISPHERE:	803	683	291[a]
Canada	95	75	17
Latin America	701	597	274
Venezuela	613	526	219
Other L. America	88	71	55
W. European Dependencies	7	11	[a]
EASTERN HEMISPHERE:	819	721	336[a]
Western Europe	163	139	42
United Kingdom	111	86	12
Other Europe	52	53	30
W. European Dependencies	157	137	74[a]
Africa and Asia	499	445	220
Liberia	[b]	[b]	3
Union of S. Africa	10	9	6
Indonesia and Major Far East Countries	120	85	45
Other	369	351	166

Note: For definitions of geographical areas see Table I; details may not add to totals because of rounding.
[a] Data for W. Europe dependencies in the Western Hemisphere not reported separately and are included with Eastern Hemisphere.
[b] Included with Indonesia and Far East Countries.
SOURCES: U.S. Department of Commerce

AUSTRALIAN OIL HUNT†

by R. C. Sprigg*

Most promising possibilities of the vast continent are believed to lie in the Great Australian Artesian Basin, but area's commercial oil must be regarded as virtually untested.

Exploration activities: Australia's need to establish its own domestic supply of oil is becoming critical. Since the wave of exploration triggered by Rough Range (Caltex and Ampol) in Western Australia in 1953, the resultant oil boom by the end of 1957 seemed to be running out. Drilling activity had slowed perceptibly; and, although Australia has at least 10 major sedimentary basins of obvious interest, only 20 wildcats were drilled for oil during 1957. The deepest well completed for the year was at the Sisters Permit area, in the Fitzroy Basin, by Associated Freney Oil Co., which reached 9,828 ft (Fig. 1).

Sediments encountered were Permian to 5,183 ft., Carboniferous to 6,190 ft, and then Devonian. A minor oil showing was reported in the Devonian—which, however, proved to be very tight.

Elsewhere in Western Australia, West Australian Petroleum Co. (Wapet) completed the Dampier Downs well in Devonian limestone at 3,028 ft, and five wells in the enigmatic Carnarvon Basin. Of the latter, the most significant finding, in Rough Range No. 10, was that gas also occurs in the Birdrong sand (in which the original oil strike had been made in 1953).

In South Australia, Santos Ltd. slowed down its exploration of the Pirie-Torrens Tertiary-Cambrian Basin, after establishing that the highly permeable dolomitized Cambrian reservoirs were extensively eroded at the Tertiary unconformity in the Wilkatana area. Remaining oils were principally residual, ozokerites. Greater attention was paid to the Western Artesian Basin, and a shallow bore at Oodnadatta penetrated the Marine Cretaceous into Jurassic, then Lower Palaeozoic at 1,320 ft. Interest was then transferred to the deeper central portions of the Artesian Basin, where enormous dome structures had earlier been located. This aspect of Santos operations is dealt with specifically in a later section.

In Victoria, a number of holes were completed in the Gippsland Tertiary-Mesozioc Basins, and showings of oil and gas were made in one hole (Oilco) at 1,290 ft in basal Tertiary glauconites. Geophysical surveys were continued in the Murray Basin by several companies, and targets for drilling were being determined.

In new South Wales, the principal operator continued to be the Australian Oil and Gas Corp., whose Dural bore, in the Sydney Basin, revealed showings of gas in the Permian at 3,063 ft. The bore was abandoned at 5,203 ft.

South Pacific Ltd. Birkhead bore in Queensland, near the Eastern Artesian Basin margin, reached 5,186 ft—penetrating Triassic beds at 1,250 ft into thick Permian sediments of terrestrial origin. Australian Associated Oilfields No. 7 well, in the Bowen syncline on the east flank of the Arcadia structure, failed to recover gas previously encountered in the crestal wells. Sediments encountered to maximum depth (3,280 ft) were all Permian in age.

While, in general, the results continued to be disappointing, enough new information was forthcoming to permit better assessment of the country's potential, and illustrate the inadequacy of even the most basic geological knowledge of the vast basin areas.

Meanwhile, Australia's urgent need for its own domestic oil supply is becoming more critical. Consumption for 1957 totaled 72 million tons (155 million barrels); and recent estimates by Shell Co. put requirements for 1962 at 108 million tons. The last figure assumes that Australia will still be dependent upon overseas supply. Were commercial oil discovered here, the pattern would be completely different.

Australia's political stability stands as a beacon in the Southwest Pacific, and must attract increasing attention by overseas oil companies. The continent has enormous little-known sedimentary basins—some of which invite close comparison with the Sahara basin and portions of the central United States. Government legislation has always been reasonable and fair in Australia, based soundly on the American constitution. Increasingly liberal official attitudes towards larger exploration companies in the closing months of 1957, coupled with a desire to meet the need for longer-term concessions over reasonably large areas, is undoubtedly about to have the effect of enticing larger foreign investment into these areas.

One of the most promising developments of 1957 was undoubtedly the discovery in the central deeper sections of the Great

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*Geosurveys of Australia Ltd.

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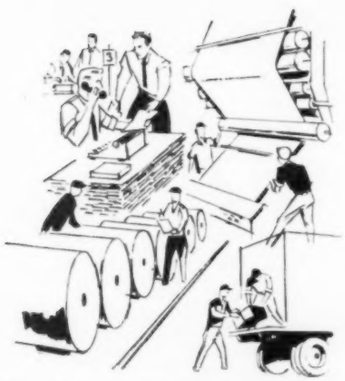


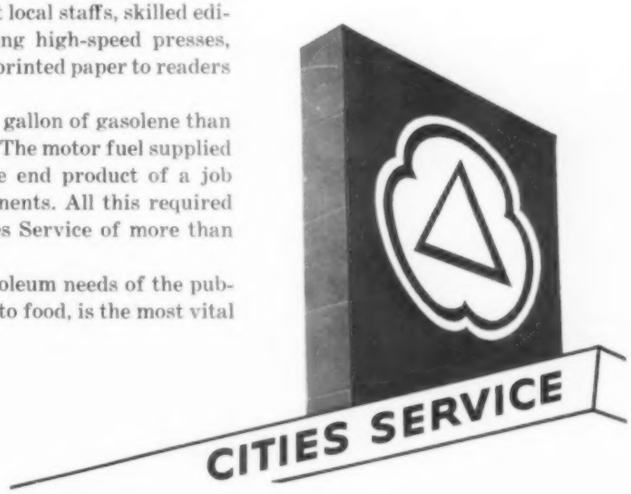
Literally everyone connected with a newspaper goes unseen except the newsboy who sells it. Editors, reporters, copy boys, makeup men, engravers, typesetters—this is but a fraction of the hidden army that brings you the news.

there's more to Cities Service than meets the eye!

A newspaper is much more than a few ounces of paper and a bit of printer's ink. It is the end product of acres of forests converted into newsprint, of world-wide news and photo organizations, diligent local staffs, skilled editors and typographers, block-long high-speed presses, and fleets of vehicles to rush the printed paper to readers while the news is "hot."

There is much more, also, to a gallon of gasolene than a chemical analysis would show. The motor fuel supplied at Cities Service stations is the end product of a job which reaches out to four continents. All this required a capital investment from Cities Service of more than $179,000,000 in 1957 alone.

Only in this way can the petroleum needs of the public be met—and petroleum, next to food, is the most vital product in America today.



Artesian Basin of a system of enormous domes with strong surface expressions and structural closure at the surface of many hundreds of feet. This area, held principally by Santos Ltd., is currently being inspected by numbers of overseas exploration companies which have expressed incredulity that such obvious structures could have remained unrecognized for so long.

The Western Great Australian Artesian Basin: This enormous area of thick Mesozoic sediments, overlapping little disturbed Palaeozic sedimentary provinces, has much in common with the Sahara basin. This fact was first noted by Dr. A. I. Levorsen, consulting for Santos Ltd. earlier in 1957. Previously this company had undertaken widespread systematic geological and geophysical surveys in this province, and had thrown much new light on it.

Dr. Leversen's opinion stimulated accelerated activity in the area by the Santos company—climaxing the discovery of a system of extremely large dome structures, clearly visible from the air over tens of thousands of square miles. Some of these structures measure 30 to 50 miles in length, and 10 to 20 miles in width.

Limb dips of the order of 5 deg to 10 deg or more are normal, and frequently the order of structural closure at the surface is 500 ft to 800 ft or more. These positive structures are accompanied also by gravity "highs" where presently investigated. Experimental seismic geophysical surveys by the Bureau of Mineral Resources late in 1957, on behalf of Santos, has confirmed a deep section of gently deformed sediments.

Concurrently, geological surveys by Santos Ltd. and the Bureau of Mineral Resources (BMR) in areas marginal to the basin to the west, northwest, and southwest have revealed the presence of widespread thick, and often highly bituminous, Cambrian source rocks in the form of black shales and limestones.

In the central, deeper, Mesozoic Basin area, about Cordillo Downs, where gentle folding is best developed, seismic surveys by the BMR have indicated sedimentary thicknesses of at least 12,000 ft.

These findings, together with R. Mott's report *(Queensland Mining Journal, 1953)* have authenticated oil and gas showings in more than 100 bores in the Queensland section of the basin (Fig. 2). Most of the showings were encountered in the shallower marginal areas, but it is important to appreciate that few bores exist in the deeper portions of the basin of present interest—practically none of which penetrates even the Jurassic. Of these deeper bores, most are located along major trunk river channels which occupy the youthful synclines. None has been located on or near any of the crests of the known domes; and, in this central area of almost a quarter of a million square miles, few bores at all extend below 500 ft.

Of the several water bores recently put down to the highly permeable "Jurassic" aquifer in southwest Queensland, two have recorded minor "showings" of oil at the artesian interface; while in South Australia, at least five recent bores in the shallow western marginal areas, near Oodnadatta, have recorded "showings" in the Marine Cretaceous.

Typically, the Artesian Basin consists of a blanket of marine and lagoonal shales 3,000 ft to 6,000 ft or more in thickness, with thin limestone and sandstone developments about halfway through the section (Fig. 3). Minor showings of oil have been recorded in lower Marine sections. The Cretaceous overlies highly permeable Jurassic and Triassic sands (aquifers) interbedded with varying thicknesses of shales and coal measures. In east-central Queensland, where beds have been penetrated in drilling, thicknesses range to several thousand feet. The sands are often remarkably "free" and immensely thick; and numerous minor showings of oil and gas have been

Fig. 2

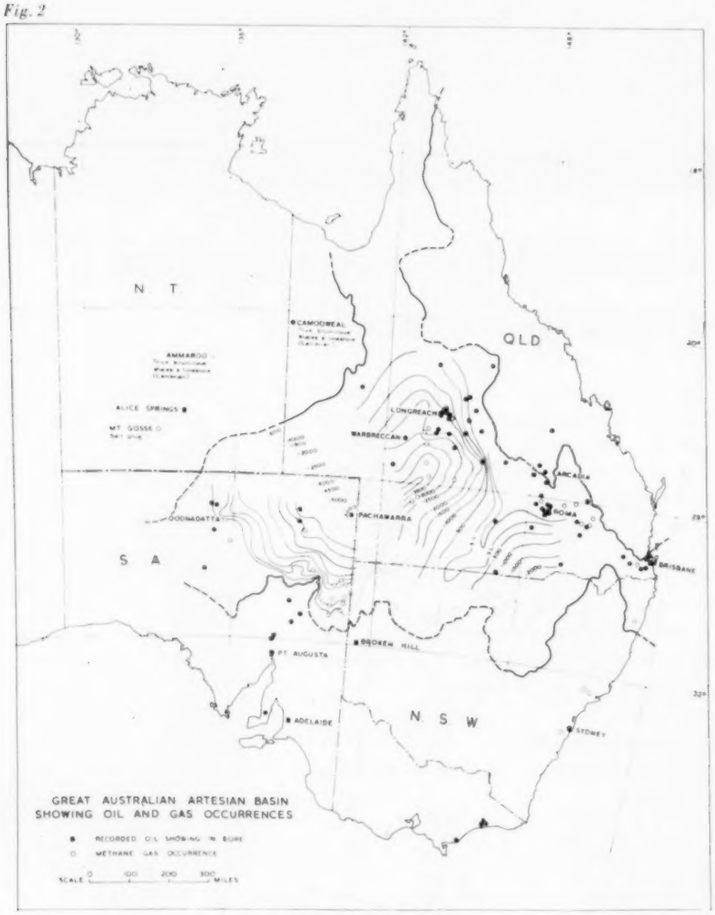
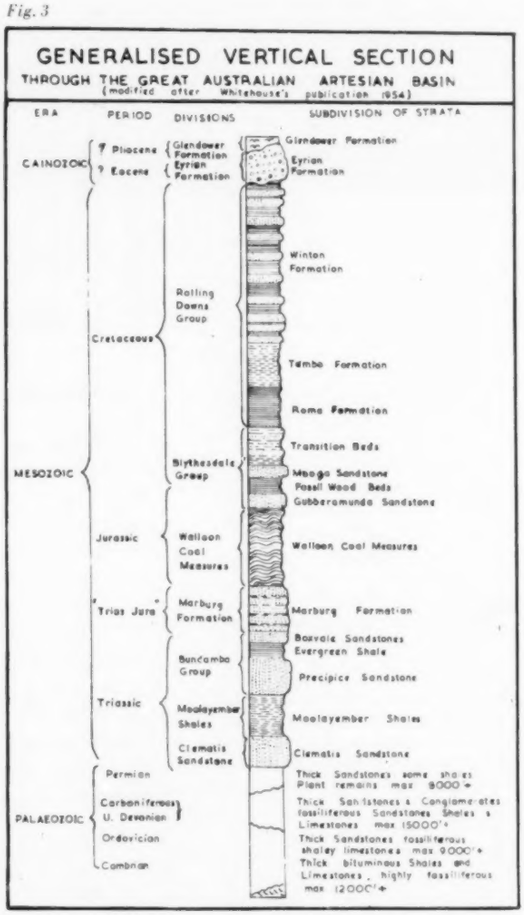


Fig. 3



The 175 ft. high Isobutane Fractionating Tower of The British Petroleum Company's new Alkylation Plant at Isle of Grain.

Britain's first alkylation plant goes on stream

The technician twists the valve that recently set Britain's first alkylation plant 'on stream'. This plant is part of The British Petroleum Company's Kent Refinery on the Isle of Grain. This BP Refinery now has the only complete unit for making Avgas in Britain. The new plant will produce 40 million gallons of Avgas a year.

BP

THE BRITISH PETROLEUM COMPANY LIMITED

encountered and recorded in them.

Although a nature of preMesozoic geology is mostly unknown in the deeper west-central portions of the basin, a thick Palaezoic section is predicted for much of the area. Thick Cambrian sections have been recorded marginally to the basin; and a complete volume of 15,000 ft, extensively marine, has been measured in the southwest at Wirrealpa, 3,000 ft or more in the Amadeus trough (northwest) and 4,000 ft or more near Boulia (north). A presumed Cambrian salt plug forms Mt. Gosse southwest of Alice Springs, and other salt-bed developments are suspected in some of the thicker red-bed developments. The Ordovician attains 9,000 ft in the Amadeus trough, and perhaps a 1,000 ft west of Boulia. In the north, these little disturbed and completely unmetamorphosed early Palaeozoic sediments thicken rapidly as they plunge beneath the Artesian Basin; and maximum Palaeozoic sedimentary thicknesses, in the more "negative" areas, can only be guessed at. In some areas, the Mesozoic section is certain to be resting on Archean locally, as shield rocks outcrop widely about the basin margin also.

Only in one bore on the edge of the central portion of the basin has granite (or metamorphic) basement been reached. This was in the Warbreccan No. 3 well of Westland Oil Co., drilled in 1956. Granite bed rock was encountered at 5,170 ft, after penetrating steeply dipping sandstones presumed to be Devonian. Oil-saturated core was reported to be recovered from 5,110 ft to 5,120 ft, but the zone was not tested. This bore site lies almost 200 miles northeast of the deepest known portion of the Artesian Basin, where Mesozoic-Tertiary fold structures have their best development.

Silurian seas are not known to have entered the depression area west of 143 deg longitude, but varyingly metamorphosed Siluro-Devonian complexes occur farther east. Near Broken Hill, NSW 15,000 ft of gently folded Upper Devonian sandstones (marine and fresh-water) have recently been measured at Mootwingee; these plunge beneath the basin to the north. To the east, in central New South Wales, large thicknesses of Silurian and earlier Devonian strata, extensively marine, have been varyingly metamorphosed and intruded by granite; but large areas may have escaped altercation, and continue to offer source-rock potential.

Carboniferous and Permian sediments, principally lagoonal and fresh-water, appear at intervals along the eastern margin of the basin. About Roma, and at Arcadia in central Queensland, Permian rocks contain small amounts of oil, but large volumes of petroliferous gas. Flows of up to two million cubic feet per day continued for years before being killed by careless development techniques and water flooding.

By way of review, it will be noted that all Palaeozoic systems are represented in the area— the early mid-Palaezoic group being dominantly marine. Only the eastern extensions of these, east of longitude 143 deg east, are likely to be metamorphosed, and the late Palaezoics have mostly escaped alteration.

The Cambrian is now known to be richly bituminous at many levels. Over wide areas, free oil—and, to a lesser extent, also petroliferous gas—has been encountered widely during the past two years, favoring the opinion that the Australian Cambrian was a major period for oil generation. Later formations also offer definite oil prospects in the area.

Structure in the Artesian Basin: Until recently, preconceived opinion had been that the Great Australian Artesian Basin lacked surface expression of geological structure. Several large companies had withdrawn from the area on this assumption.

The discovery, centrally within the basin, of enormous domal structures with strong topographic expression has now come as a major surprise to Australian geologists. Rocks exposed in these structures are principally Cretaceous sandstones and shales, with a thin veneer (20 ft to 100 ft) of silicified Tertiary conglomerates. Dr. R. L. Jack (1924) had previously alluded to gentle folding in the Cordillo Downs area of northeastern South Australia, but its significance had gone unnoticed. Santos surveys, in 1954, revealed that major stream patterns were influenced by gentle warping or folding of basin sediments. In fact, most bores in South Australia have since been shown to lie along synclines, for the reason that pastoralists have searched for water along these major river channels, where feed is best; and, as a result, the anticlines had completely escaped attention.

The fold structures of northeastern South Australia and southwest Queensland are obviously tectonic. Long ridges and "divides" formed by these structures, and outlined sketchily on existing topographic maps, had long been considered to be merely erosional. This is not the case. Cretaceous and Tertiary sediments, in outcrop, are gently deformed into great anticlines and domes often many tens of miles long, and 10 to 20 miles wide. The principal structures are the Cordillo anticlinorium and the Betoota, Curalie, Innamincka, Durham Downs, and Orientos domes. Numerous smaller domes surround these structures, and also progressively plunge southwest beneath the Lake Eyre plains.

Fold axes mostly trend northeast or north-northeast, and domal "closure" at the surface is measured in hundreds of feet. Limb dips of 2 to 10 to 12 degrees are usual, but locally dips may attain 20 deg for considerable distances. Generally, the homes are symmetrical structures; but, in the Cordillo anticlinorium, there is a tendency to asymmetry.

Definite faulting has not been observed at the surface in any of the structures examined in detail, but some of the assymmetry of the Cordillo structures may be attributed to fault movement in depth.

Although consideration of stratigraphic traps is unjustified at this stage, important possibilities are presumed to exist at the base of the Mesozoic section, in contact with Palaeozoic strata. A great potential for uncomformity and wedge-out traps could be inferred.

Petroleum Possibilities: Three sets of geological conditions favor the occurrence of commercial oil in the Artesian Basin. These may be summarized as follows:

1. Showings of oil have been authenticated in more than 100 bores in Queensland and South Australia in Mesozoic Artesian Basin strata. This is additional to methane natural gas which occurs still more widely, and in greater concentration, in the Lake Frome Basin to the south.

2. These oil and gas showings have been recorded in the Cretaceous, Jurassic, and Triassic, and also in the underlying Permian and Cambrian.

3. Marine source beds occur in the Cretaceous, in the enormously thick Cambrian successions which plunge beneath the basin about the margins, and in the thick Ordovician and Devonian sequences.

4. Some of the oil showings in Triassic and Jurassic formations in eastern Queensland immediately overlie granite unconformity, indicating considerable lateral migration from unknown sources.

5. Thick, highly permeable sandstones offer ideal zones for hydrocarbon migration, and provide enormous reservoir storage potential in a variety of potential structural and stratigraphic traps.

6. Major dome structures, capped by thick impervious sections of Cretaceous shales, occur widely in the central basin area. Dimensions are of the order of tens of miles in length and width, and surface-expressed closure is of the order of many hundreds of feet.

7. Innumerable possibilities for stratigraphic traps and porosity wedge-outs undoubtedly exist in this great and geologically varied basin area.

8. An absence of faulting, except in marginal basin areas, and in depth, in the presence of the ubiquitous cover of impermeable Cretaceous shales, will have facilitated maximum retention of the contained hydrocarbons.

Summary and Conclusions: Minor oil showings are distributed widely throughout the Great Australian Artesian Basin. Mesozoic sediments attain 6,000 ft to 8,000 ft in thickness centrally within the basin, and blanket a variety of preMesozoic sedimentary environments. In the Cordillo Downs area, seismic surveys (BMR) have indicated few disturbed sediments extending to beyond 12,000 ft.

Source beds for oil occur in the marine Cretaceous, and within the thick richly fossiliferous and bituminous Cambro-Ordovician marine sections which plunge beneath the basin around much of the western perimeter of the basin. Thick sequences of Devonian, Carboniferous, and Permian sediments, also unmetamorphosed, may also contain source beds for oil.

Blanketing sands overlie the Palaezoic

The "Inside Story" of the Heart of Your Rig

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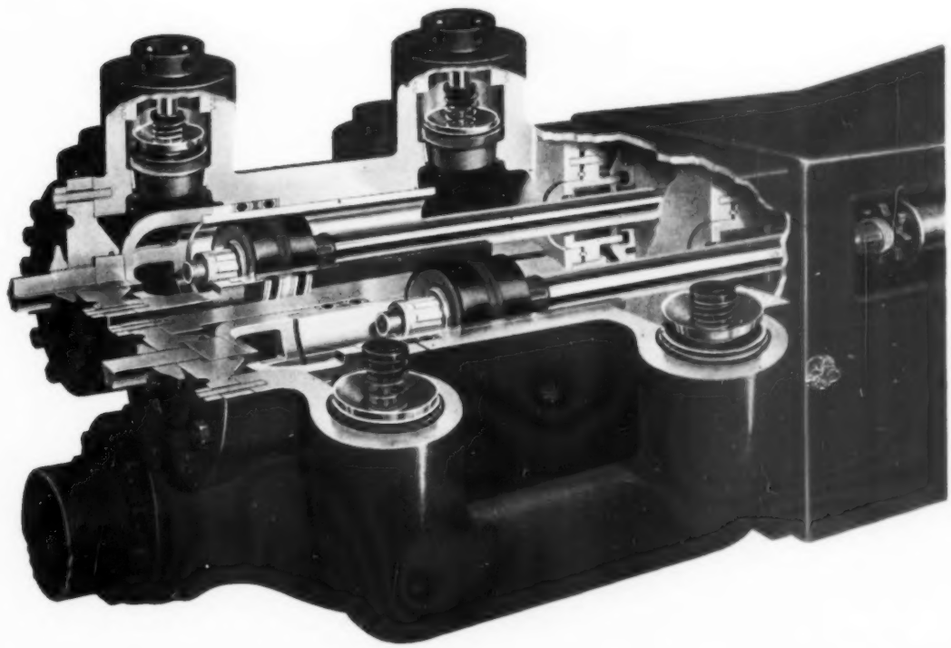

This cutaway view of a mud pump shows where the vital Mission fluid-end parts fit and why they are essential to correct operation. Forces on these parts are staggering. For example, pistons and rods may be subjected to forces of more than 100,000 pounds.

Liner packing and gland packing may be exposed to pressures exceeding 2000 psi, and valves and seats are required to stand violent impact every time they close.

Liners, also, are subject to "rocking," which aggravates both piston and liner packing wear unless all critical liner dimensions are held within API specifications.

These forces may be multiplied by shock loading at times, and they are completely reversed at least once every second. When you remember that mud may contain abrasive sand to cut metal parts, corrosive chemicals to pit them, and oil to attack rubber, it seems obvious that only the best pump parts stand a chance.

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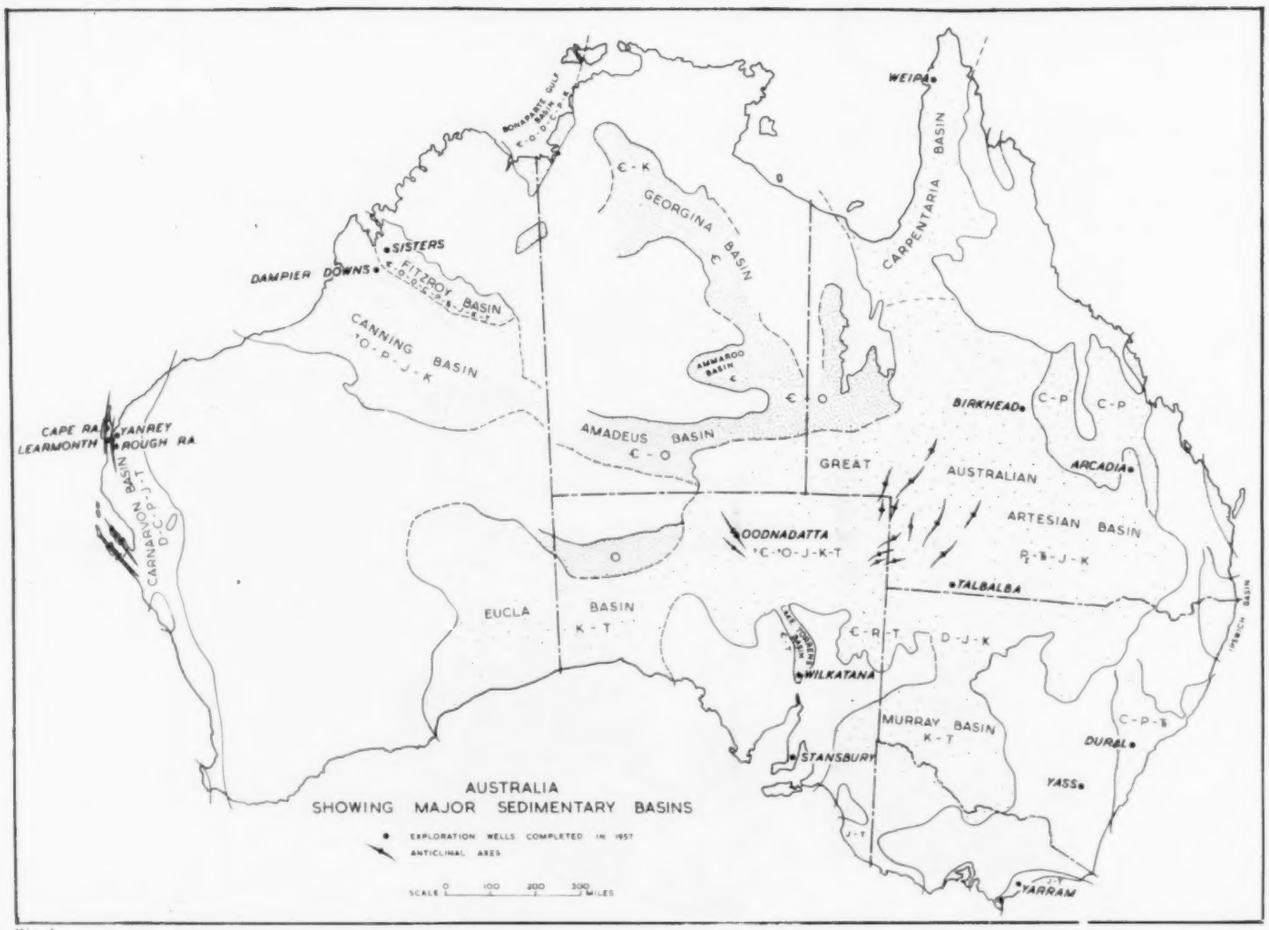

Fig. 1

unconformably at several horizons low in the Mesozoic sequence, and these are capped by impermeable Cretaceous shales over virtually the whole basin area. These Triassic and Jurassic sands are extremely permeable, and offer remarkable storage capacity, for entrapped hydrocarbons; and also provide channels for migration.

A large variety of structural and stratigraphic traps may be presumed in the Mesozoic section, and also against their basal unconformities with the Palaezoic. The recent discovery of long lines of immense domed anticlines, with closures measured in hundreds of feet, offers immediate targets for drilling. Some of these domes are several tens of miles long and wide, and limb dips range from 2 deg to 15 deg or more. They form major topographic features in the central basin area, and can be seen from 50 to 100 miles away from the air. Preliminary seismic surveys indicate that essentially conformable structures continue to at least 6,000 ft or 7,000 ft in depth. Their situation in the central basin area of deepest Mesozoic sedimentation, and possibly overlying thick Palaezoic development at depth, is of obvious importance. The presence also of widespread, and highly permeable, sands—at depth beneath the impervious Cretaceous sediments—would appear to offer unusually promising conditions for the accumulation and retention of hydrocarbons.

Comparison with the geology of the recently discovered oil fields of the Sahara is tempting. In an area of more than a quarter of a million square miles, one bore only has penetrated the full Mesozoic succession. The commercial oil possibilities of the area must, therefore, be considered virtually untested.

The deeper central and western development of the Great Australian Artesian Basin is now considered to offer the most promising prospects for commercial oil on the Australian continent. Thicknesses of 5,000 ft to possibly 10,000 ft or more of Mesozoic sediments—including several thousand feet of marine Cretaceous shales—overlie great and variable thicknesses of unmetamorphosed marine Upper Devonian, Ordovician, and Cambrian sediments in the central and western basin areas. Metamorphism has affected these older sediments only in the easterly portion of the basin in Queensland, and New South Wales.

Numerous oil and gas showings have been authenticated in the Mesozoic basin sediments in the shallower marginal zones of the basin, but the deeper areas remain virtually untested. Over the most interesting deeper portions of the basin, no bore has penetrated even the full section of the marine Cretaceous in an area of more than 160,000 square miles.

A recent development, which revolutionizes geological thinking for Australian exploration, has been the discovery of long lines of anticlines in the central basin area (Cordillo Downs, in northeastern South Australia, extending into Queensland). Many of these exhibit complete domal closure at the surface, measured in hundreds of feet.

One of the bright spots on the record for the year was the visit to Australia of Dr. A. I. Levorsen from Tulsa, Okla., to report internally on Santos holdings in the Great Australian Artesian Basin and certain Cambrian areas. His public expression of confidence of oil prospects in the western portions of the Artesian Basin, where Santos gelogists had demonstrated potential structure and a better interpretation of Mesozoic geology in relaion to underlying Marine Palaeozoics, gave new impetus to the search in this vast province. His comparisons with the geology of the Sahara, and of west Texas, and his discussions with government agencies led ultimately to the commonwealth's allocation of a pound-for-pound drilling subsidy to encourage stratigraphic drilling in approved basin areas, anywhere in Australia. END

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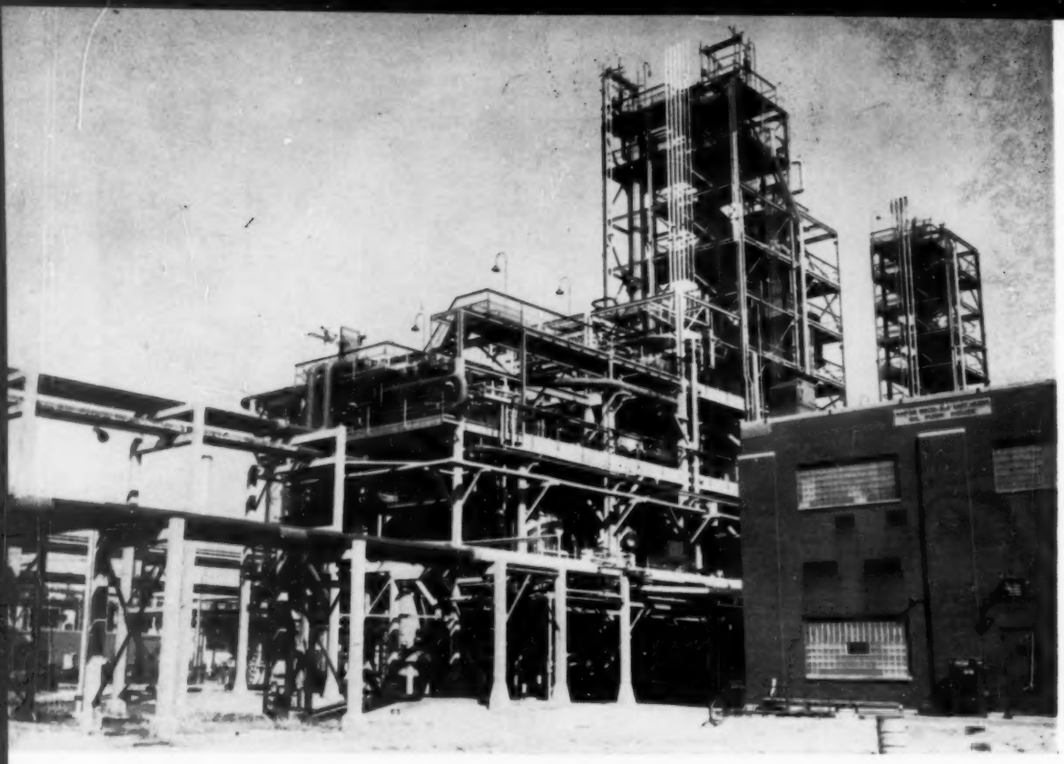


Propylene-recovery unit No. 200, Standard Oil Co. (Indiana), Whiting, Ind., refinery.

Petrochemical horizons for propylene

Part IV: *Nonene, dodecene, and oxo derivatves*

by Peter W. Sherwood*

THE conversion of propylene to its trimer (nonene) and tetramer (dodecene) is but a specialty application of polymerization processes which have served refiners since 1935 in upgrading light olefins to fuels in the boiling-point range of gasoline. Substantially similar operating methods are employed; a chief difference is the recirculation of propylene dimer and, if dodecene is the desired product, the recycling of propylene trimer as well.

The chemical demand for propylene trimer and tetramer is essentially a postwar development; it is tied to the rapid expansion which has taken place since 1950 in the demand for synthetic detergents and *oxo*-based plasticizers. Market aspects of both of these end products will be discussed in subsequent section (for *oxo* products, see below: Part V of this article series will deal with commercial aspects of propylene-derived alkyl aryl sulfonates, the most important line of synthetic detergents).

In overall market importance, dodecene far outstrips nonene. Of the estimated 540 million pounds propylene converted to these two polymers during 1957, an estimated 80% was consumed in the manufacture of the tetramer.

The reason for this is simply the paramount importance of docecyl benzene sulfonate detergents which account for the lion's share of dodecene. The only other sizable chemical outlet for dodecene is in the *oxo* conversion to tridecyl alcohol raw material for a line of specialty surfactants.

Propylene trimer output is tied to a greater extent to *oxo* demand. Its *oxo* derivative, decyl alcohol, is of significance in the production of phthalates and sebacates which serve as plasticizers for polyvinyl chloride. Another large share of nonene output is consumed in the manufacture of nonyl phenols which serve as nonionic surface-active agents.

Together, these markets have caused USA production of nonene and dodecene to rise from a total of approximately 109 million pounds in 1951 to 500 million pounds five years later. A breakdown is given in Table I.

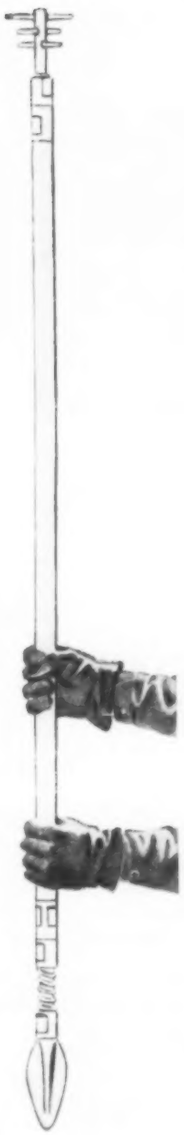
TABLE I
Chemical Consumption of Nonene and Dodecene
(Millions of Barrels)

	Nonene	Docecene
1951	15 (est.)	93.5
1954	98.6	316.3
1955	146.2	371.9
1956	105.1	394.5

Technology of Trimer and Tetramer Production: Production of the trimer and tetramer of propylene belongs to the class of processes referred to as "polymerization" in refinery technology. The process—more accurately referred to as "oligamerization"—must be distinguished from the more recently developed propylene polymerization processes which will yield products in a molecular-weight range of 80,000 to 100,000, to be dealt with in Part V of the present series. By contrast, the molecular weight of the trimer and tetramer of propylene is 126 and 168, respectively.

Production of nonene and dodecene from propylene is today carried out universally in the presence of a phosphoric acid-based

*Chemical Engineer, White Plains, N.Y.



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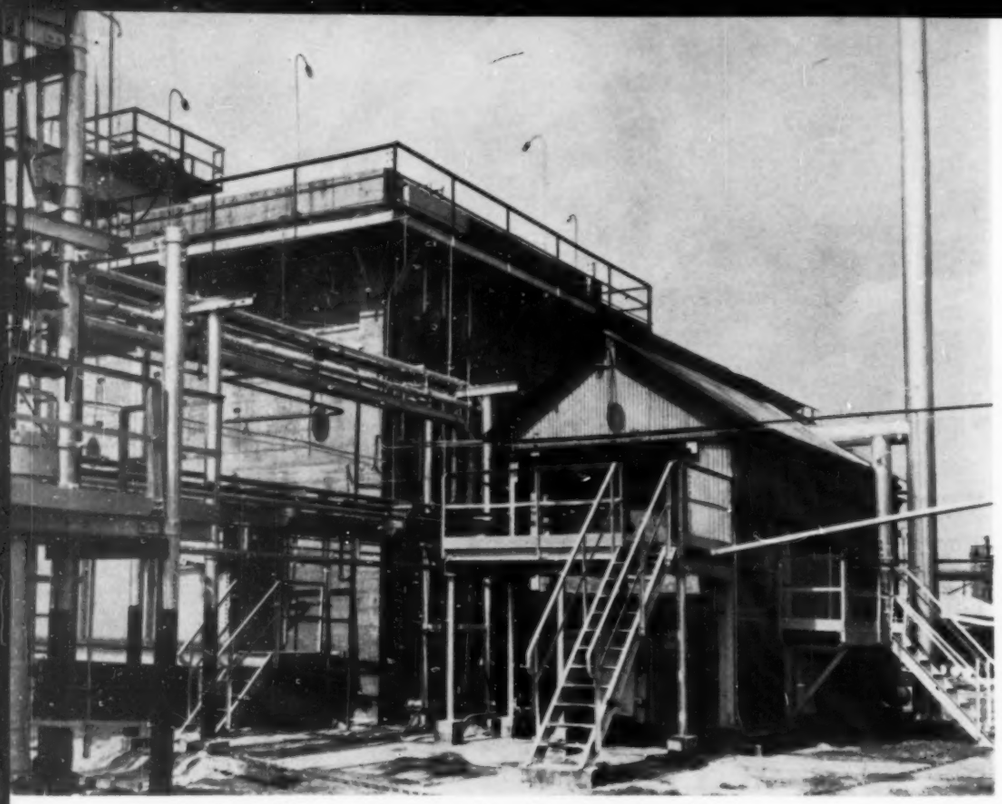

Esso Standard Oil Co.'s oxo reactors at Baton Rouge, La., are located within a concrete enclosure formerly used for high-pressure hydrogenation.

catalyst. In this category, two types of catalyst have seen commercial service: (a) the phosphoric acid-Kieselguhr catalyst developed by Universal Oil Products Co., and (b) phosphoric acid coated as a thin film on quartz particles (California Research Corp.). In addition, promise is shown by some catalysts which are still in the developmental stage, among them nickel-oxide-silica-alumina and silicotungstic acid supported on bauxite.

The following discussion will call attention to the highlights of propylene polymerization techniques using the commercially significant phosphoric-acid catalysts.

(a) *Conditions in UOP Catalyst Operation:* It is necessary that the feed stock be freed of hydrogen sulfide. At polymerization conditions, this material reacts with olefin to yield mercaptans which would impair the quality of product.

Certain other impurities must be removed from the feed stock because of their deleterious effect on activity of the polymerization catalyst. Included among these contaminants are ammonia and amines which will neutralize phosphoric acid, the active principle of the UOP catalyst. Also objectionable is the presence of oxygen which accelerates formation of tar and coke on the catalyst.

Egloff and Weinert[1] have shown the effect of process variables (temperatures, pressure, contact time, catalyst activity) and emphasize the need for their proper coordination, adapted to the feed stock's composition and to the desired conversion and polymer quality.

In the polymerization of propylene, operating *temperature* is in the range 200 C to 250 C. The temperature is increased as the catalyst activity declines with increasing age. At no time may the temperature exceed 265 C because of the rapid resulting tar and coke formation.

The polymerization reaction is accompanied by a decrease in volume and is, therefore, favored by increasing the *pressure*. By increasing operating pressure, shorter contact time may be employed, thus decreasing the needed reactor volume. Furthermore, at relatively high pressure, there will be a hydrocarbon dense phase which washes the catalyst part-free of deposits, thus keeping up its activity. Pressure operation also permits satisfactory conversion at lower temperatures. Thereby it decreases the catalyst's dehydration tendency and lengthens its active life.

This need to maintain the catalyst in its proper state of hydration also makes it necessary to adjust the moisture content of the feed. Since there is a temperature gradient through the catalyst bed, feed-water concentration is adjusted to the requirements of the catalyst at its lowest reactor temperature. This is done because some underhydration of catalyst is to be preferred to overhydration.[1] For, while underhydration favors coke formation and catalyst deactivation, presence of excessive moisture leads to catalyst softening and plugging, and eventually to corrosion difficulties from leached-out phosphoric acid.

There are three basic types of reactor used in conjunction with UOP polymerization catalyst. The oldest type is a catalyst-packed tower operated slightly below the stabilizer pressure. Because of rapid catalyst fouling at the relatively low pressure, regeneration is necessary. This is accomplished by burning, whereby a low oxygen concentration must be maintained to prevent overheating (temperature range 350 C to 510 C). After regeneration, steam is turned into the converter in order to rehydrate the catalyst to maximum activity.

Because of rapid catalyst fouling and high cost of regeneration equipment, low-pressure (250 psi) polymerization has come into disfavor. By operating a catalyst tower at 500 psi minimum, sufficiently low operating temperature becomes feasible to cut down very considerably on catalyst fouling, and regeneration may be wholly eliminated. At the same time, better conversion is attained.

The most modern type of polymerization reactor is of the shell-and-tube design. It, too, is operated at elevated pressure. Substantially isothermal conditions are maintained, while heat of polymerizing propylene causes a temperature rise of about 40 C between inlet and outlet of adiabatic catalyst towers. The close temperature control which is possible in isothermal (shell-and-tube) converters boosts catalyst life, olefin conversion, and polymer yield. Regeneration is not necessary.

Typical of operation in the three types of polymerization converter are the conditions reported by Weimert and Egloff[2] for processing C_3-C_4 mixtures (see Table II).

TABLE II—TOWER TYPE

	Low-Pressure Regeneration	High-Pressure	Shell-and-Tube
Pressure, psi	250	500	900
Catalyst temperature, deg C:			
Inlet	203	190	203
Outlet	245	232	212
Olefin content, %:			
Fresh feed	35	35	35
Combined feed	20	20	35
Spent gas	10	5—7	4
Olefin conversion, %	80	85—90	92
Catalyst life, gal per lb of catalyst	50	75	150

Normal polymerization practice for propylene leads to a complex hydrocarbon mixture, predominating in the C_6-C_9 range.

Normal polymerization practice for propylene leads to a complex hydrocarbon mixture prodominating in the $C6_6$-C_9 range. For the preferential production of one specific compound (notably propylene tetramer), steps must be taken to achieve substantial improvements in its yield over that obtained in normal practice.

This objective may be attained by recycling the lighter-boiling byproducts to the reaction stage after separation from the desired tetramer. In a process developed by Universal Oil Products Co.[3], yields of the order of 75% of theory are achieved by this mode of operation.

(Continued on page 78)

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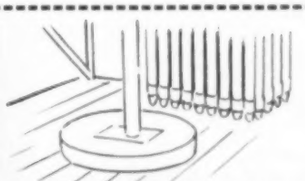

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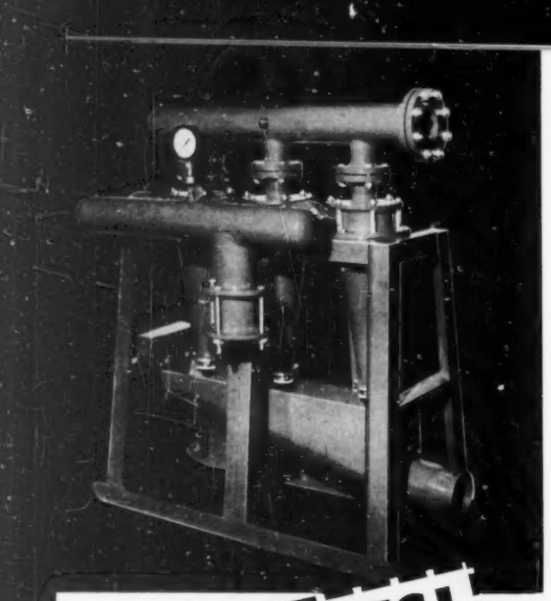

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Petrochemical Horizons

(Continued from page 76)

Regular UOP polymerization catalyst serves in the process. Conditions are chosen to maintain a mixed liquid-and-vapor phase within the reactor. In the vapor phase, the main components are unconverted propylene plus recycle propylene dimer and some trimer, while most of the trimer-plus—of course, higher-boiling products—are present as liquids. The converter effluent is cooled and condensed (propylene itself remains in the gas phase). After separation from the tetramer, the dimer and trimer of propylene are recycled to the converter where they are joined by makeup propylene. (If nonene is also a desired product, only the dimer is recirculated.)

A fairly dilute propylene stream may serve as feed stock. The reaction for tetramer production is carried out in the operating range outlined above for nonspecific polymerization. Mayland et al.[3] cite an example in which the feed stock is 31% propylene, 65% propane, 2.5% butanes, and 1.5% higher hydrocarbons; 0.5% by weight of moisture is added to the charge to safeguard the catalyst. The stream is fed to the reactor containing UOP phosphoric-acid catalyst. Conversion is carried out at 230 C and 900 psi inlet pressure. The gaseous reactor make enters a partial dephlegmator, mainly for condensation of propylene dimer. The liquid so formed is recovered and returned to reactor feed tanks for further polymerization.

Product leaving the reactor in the liquid phase is fractionated. Overhead trimer may be sold as nonene product, or it may be returned to the polymerization reactor for further conversion to the tetramer.

The bottoms of the primary fractionation column are further distilled for the recovery of tetramer from associated hydrocarbons. In operation for maximum tetramer yield (i.e., with complete trimer recycle), about 75% of the feed propylene is accounted for as the desired product. A further improvement in yield is claimed[5] if only the C_8-C_{10} product (i.e., chiefly propylene trimer) is recycled to the primary reactor. The lighter condensible fraction (chiefly propylene dimer) is polymerized separately.

As may be expected, none of these polymerization reactions lead solely to the self-condensation derivatives of propylene. The various fractions also contain byproducts arising from numerous side reactions, and a bleed stream of dimer and trimer recycle must be taken in order to prevent undue buildup of the waste material contained therein. Recycling dimer and trimer to extinction is economically not feasible in the manufacture of propylene-derived dodecene.

(b) *The Catalyst of California Research Corp.:* A number of installations employ the polymerization catalyst developed by California Research Corp. This catalyst consists of a thin film of phosphoric acid on crushed quartz. It is characterized by high mechanical strength and ease of regeneration. The catalyst, furthermore, may be easily replaced by washing off the acid layer and recoating the retained quartz particles *in situ* by soaking with commercial phosphoric acid of 70% to 85% strength.

Langlois and Walkey[5] report that this catalyst can be used over a wide range of pressure, temperature, and water content of the feed stock. Accidental overhydration does no permanent damage to the catalyst, but ammonia and amines are poisons and must be removed from the charge. The long catalyst life permits the production of some 140 gal of polymer per pound of phosphoric acid if the feed is properly freed of poisons.

A careful study of the effect of operating variables on performance in the presence of California Research Corp.'s catalyst has been made available by Langlois and Walkey[5]. *Acid concentration* has a very pronounced effect on reaction rate. The effect on rate is particularly pronounced in the concentration range 100% to 108% H_3PO_4. Within the limits of the heat-removal system's capacity, it is, therefore, desirable to operate at the maximum feasible acid concentration. At a strength as high as 106%, catalyst life is still satisfactory.

Phosphoric acid's water-vapor pressure is not negligible. Losses of water must be made up by careful control of the feed stock's moisture content.

The feed rate for a constant conversion is directly proportional to *pressure*. Operation at elevated pressure calls for a drier feed if the catalyst concentration is to be maintained. The water content of the feed stock is normally set by the temperature of the last water wash preceding the polymerization unit. Subsequent drying is economically not often justified. Thus, it is the moisture content which generally fixes the best operating pressure—200 to 500 psig for most installations[5].

Polymerization is preferably carried out between 150 C and 200 C. The reaction rate has a relatively low-temperature coefficient. Operation above 200 C is deleterious to catalyst life.

Langlois reports that the properties of the polymer are influenced but little by reaction conditions. Average boiling point decreases slightly as pressure and temperature are increased, but is not affected by acid concentration.

The foregoing is the first half of Part IV of Mr. Sherwood's article. The remainder will appear in a subsequent issue of *World Petroleum*.

A push-button operated model of the complete reflection seismic cycle, from shot to corrected record section, is on display at the New York Stock Exchange by Geophysical Service Inc., of Dallas.

The animated reflection seismic exploration demonstrator, as pointed out by GSI President F. J. Agnich is an integral part of an exhibit sponsored by GSI's parent company, Texas Instruments Inc.

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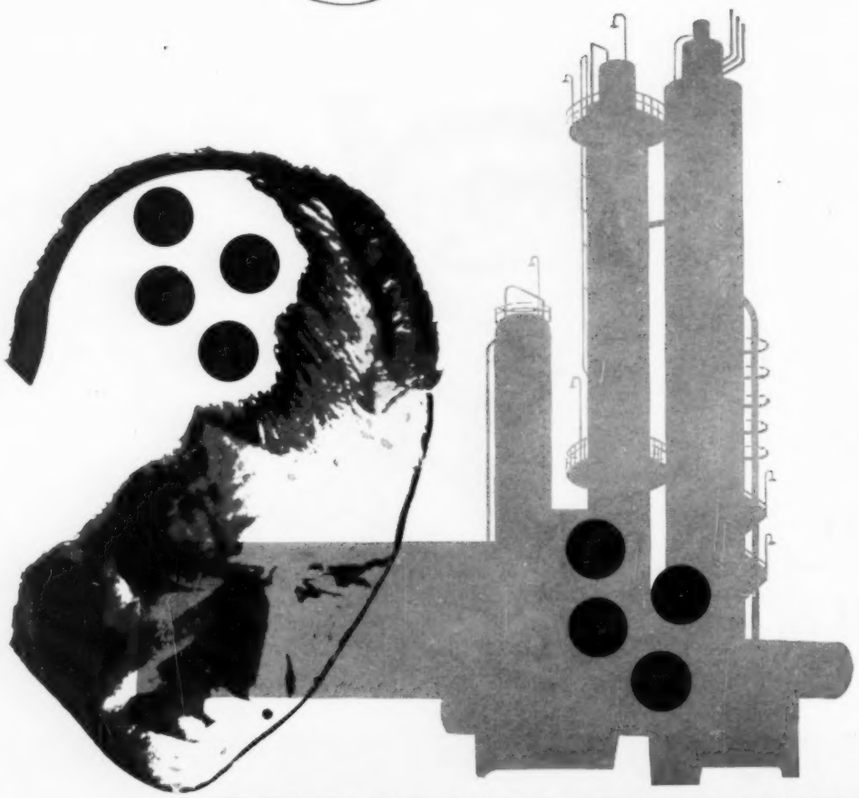

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WORLD-WIDE CONSTRUCTION FOR THE PETROLEUM, PETROCHEMICAL, AND CHEMICAL INDUSTRIES

John Eenink (standing) and R. A. Cunningham, Hughes engineers engaged in rock-bit penetration research, are shown here examining results of laboratory test. In front of them on the table are two- and three-cone bits, 1¼ in. in diameter, used to drill cores in a high-pressure laboratory drilling rig. The cores represent the various types of formations encountered in actual drilling. Bottom-hole conditions and pressures under which these formations are encountered are simulated in the Hughes high-pressure drilling rig.

Miniature rock bits simulate deep-well drilling

HUGHES Tool Co. engineers, using miniature rock bits approximately 1¼ in. in diameter, are drilling cores in a laboratory drilling machine in which pressures can be varied between zero and 15,000 psi. The latter is approximately the mud-column pressure of 9.5-lb mud in a 30,000-ft well.

The ingenious high-pressure drilling machine can simulate bottom-hole formation pressures, overburden pressures (weight of formations from bottom of hole), and mud-column pressure (presure of drilling fluid or mud at the bottom of hole). The machine and microbits—equipped with rolling cones similar to regular drill bits—were developed by Hughes engineers.

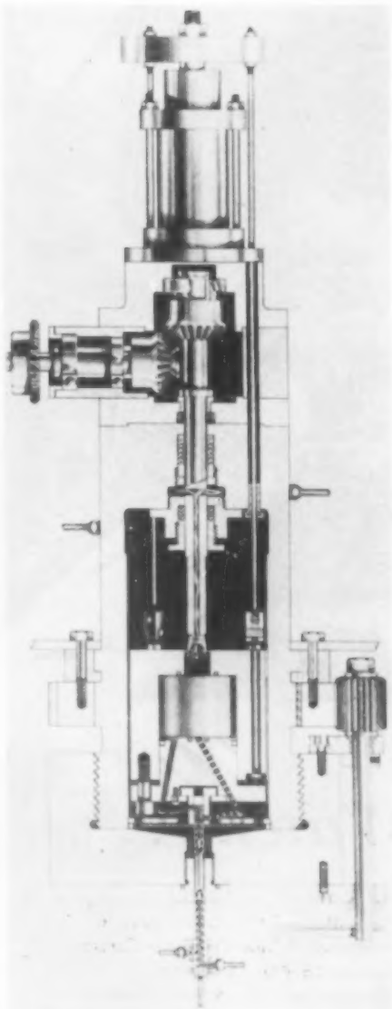
Results of the high pressure drilling research, now in its sixth year, were revealed at the recent annual meeting of the Society of Petroleum Engineers of AIME, in Houston, by the two engineers who supervised the research: R. A. Cunningham, and John G. Eenink.

"What we are doing," explained engineers Cunningham and Eenink, "is equivalent to bringing the bottom of the hole to the surface, whether it is down ten or ten thousand feet, so we can see what is actually taking place at the point where the bit is contacting the formation.

"For years, certain phenomena have occurred in drilling oil wells for which operators have guessed the reasons, but have never been sure," said the engineers. "Formations encountered at deeper depths have always been harder to drill than the same formations at shallower depths. Frequently, soft formations are encountered that should be drilled at a high rate of speed but that virtually stall the bit, reducing the penetration rate to only a foot or two an hour."

"Guessing at the solutions of these and countless other problems encountered in oil well drilling," said Mr. Cunningham and Mr. Eenink, "has proved both expensive and time-consuming to the industry. That is why six years ago, Hughes Tool Co. began a special research project to see if answers could be found.

Photograph of a sectional drawing of new Hughes high-pressure laboratory drilling rig: The new rig can simulate mud column, overburden and formation pressures from surface to depths of over 20,000 ft. Any one or all of the three pressures can be varied to show their effect on drilling. The 1¼-in. bit used to drill cores in the high-pressure chamber can easily be adjusted from zero through 1,200 rpm. Thrust on the 1¼-in. bit can be increased to over 7,000 lb. The jet velocity capacity of the new rig is approximately 400 ft per sec.



"With the new high-pressure drilling equipment, we have been able to simulate, in the laboratory, most of the conditions encountered in actual oil-well drilling. Being able to set up the desired set of conditions, we have been able to repeat them, time and again, under close control, thus enabling us to try out various corrective measures and to determine their respective merits."

Dr. Daniel J. Martin, vice president-engineering for Hughes, in discussing the laboratory high-pressure drilling research, disclosed that several major oil companies are now installing similar equipment to carry the work on further. Dr. Martin also said that his company had already charted high-pressure drilling research for the next five years.

Engineers Cunningham and Eenink told the AIME conference that bit design is not the primary solution to faster penetration rate under many conditions encountered in oil-well drilling. They pointed out that controlling mud-column pressure (the pressure of the mud used in the well to seal off the walls of the hole and to prevent

(Continued on page 82)

blowouts) can have as much, if not more, effect on penetration rate than the design of the drill bit used.

An example in point, they said, was a condition frequently encountered in the Gulf Coast area when the mud-column pressure greatly exceeds the formation pressure in highly permeable formations. When this happens, the water in the drilling mud is forced into the formation, leaving the mud to form a plastic-like substance known as "filter cake" which retards the removal of the cuttings from the bottom of the hole. As a result, the bit teeth grind away on mud and cuttings, making little progress in chipping away new formation.

Because this is a constantly re-occurring problem, it has been given high priority in the high-pressure drilling research. Hughes engineers have found that, when filter cake forms in a hole, if the weight of the mud in the hole cannot be reduced because of the danger of blowouts, it is best to use jet bits with a high nozzle velocity which will wash away the mud and cuttings more rapidly, permitting the bit teeth to contact the virgin rock on the bottom of the hole.

Engineers Cunningham and Eenink summed up the findings of the high-pressure drilling research as follows:

1. Drilling rates decrease markedly in highly permeable formations with increased difference in pressures (between the formation and mud column). With 1,00 psi pressure difference, drilling rates may be reduced 60% to 70%, compared to drilling rates with no pressure difference.

2. The formation of layer of cuttings at the drilled surface (when filter caking takes place) causes recutting of the cuttings by the bit.

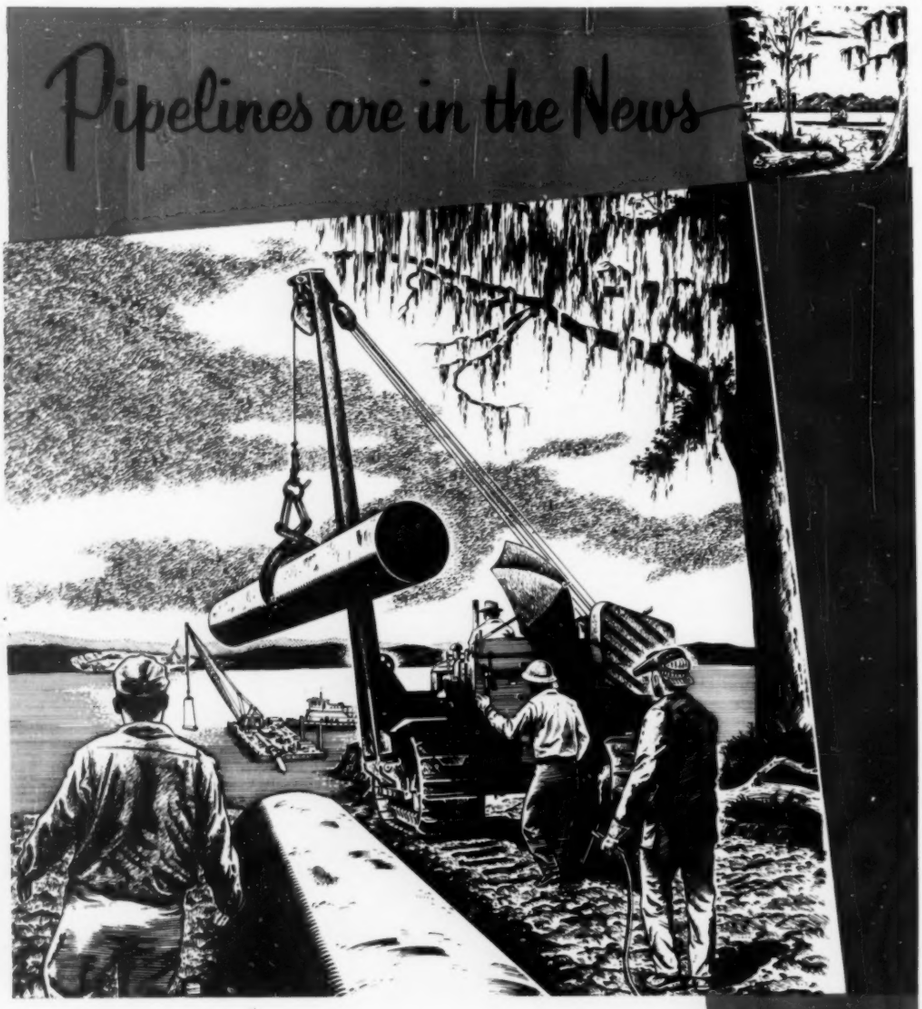
3. Improved cleaning helps remove this layer of cuttings, allowing the rock-bit teeth to penetrate the formation. Higher pressure differences require higher jet velocities to assure proper cleaning of the bottom of the hole.

4. Unconsolidated sand can be difficult to drill under high-pressure differences. (The same formation can be drilled at a high rate of speed where the mud-column pressure can be lightened.)

5. Improved drilling rates will result with increased jet velocity and decreased pressure difference.

6. If formation pressure is greater than mud-column pressure, a slight increase in drilling rate results from the cleaning (of the bottom of the hole) by the formation fluid flowing into the hole.

7. Overburden pressure had practically no effect on drilling rate in permeable sandstone. (For years overburden pressure was regarded as one of the reasons the deeper formations were harder to drill. Engineers Cunningham and Eenink in their tests showed that, where gas and/or air were used, instead of mud, to circulate the cuttings out of the hole, there was little difference in penetration rate at 1,000 ft or 10,000 ft.) END



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McCollum Receives Award

L. F. McCollum, president of Continental Oil Co. (left) received the Distinguished Service Award of the Texas Mid-Continent Oil and Gas Assn. for outstanding service to the oil industry during 1958, at the organization's annual meeting in Dallas. Presenting the award is Robert F. Windfohr, Fort Worth independent oil operator. Last year a national poll resulted in McCollum's being named one of America's Fifty Foremost Business Leaders.

New Tool Pusher's Manual

Fourth edition of the *Tool Pusher's Manual*, the oil-well drilling industry's widely used field handbook, is now available from the Dallas offices of the American Assn. of Oilwell Drilling Contractors, 505 North Ervay, Dallas.

Erratum

Table on page 150 of September *World Petroleum*, referring to half-yearly earnings of oil companies, incorrectly stated American Petrofina had deficit of $29,297,000. This should have read deficit of $296,000.

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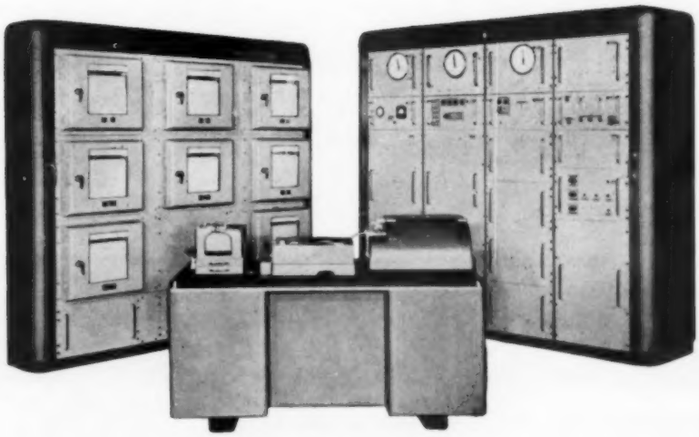

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West to the Orient

NEW DESIGNS FOR NEW PRODUCTION RECORDS

With local demand running far greater than imported supplies, Nippon Petrochemicals Co., Ltd. called on Stone & Webster to design Japan's first Isopropyl Alcohol and Acetone plant. And within a few days of being placed on stream, this flexible, highly instrumented plant at Kawasaki has produced at a rate above designed capacity and purity. This is Japan's first petrochemical unit to set such a production record from the very start.

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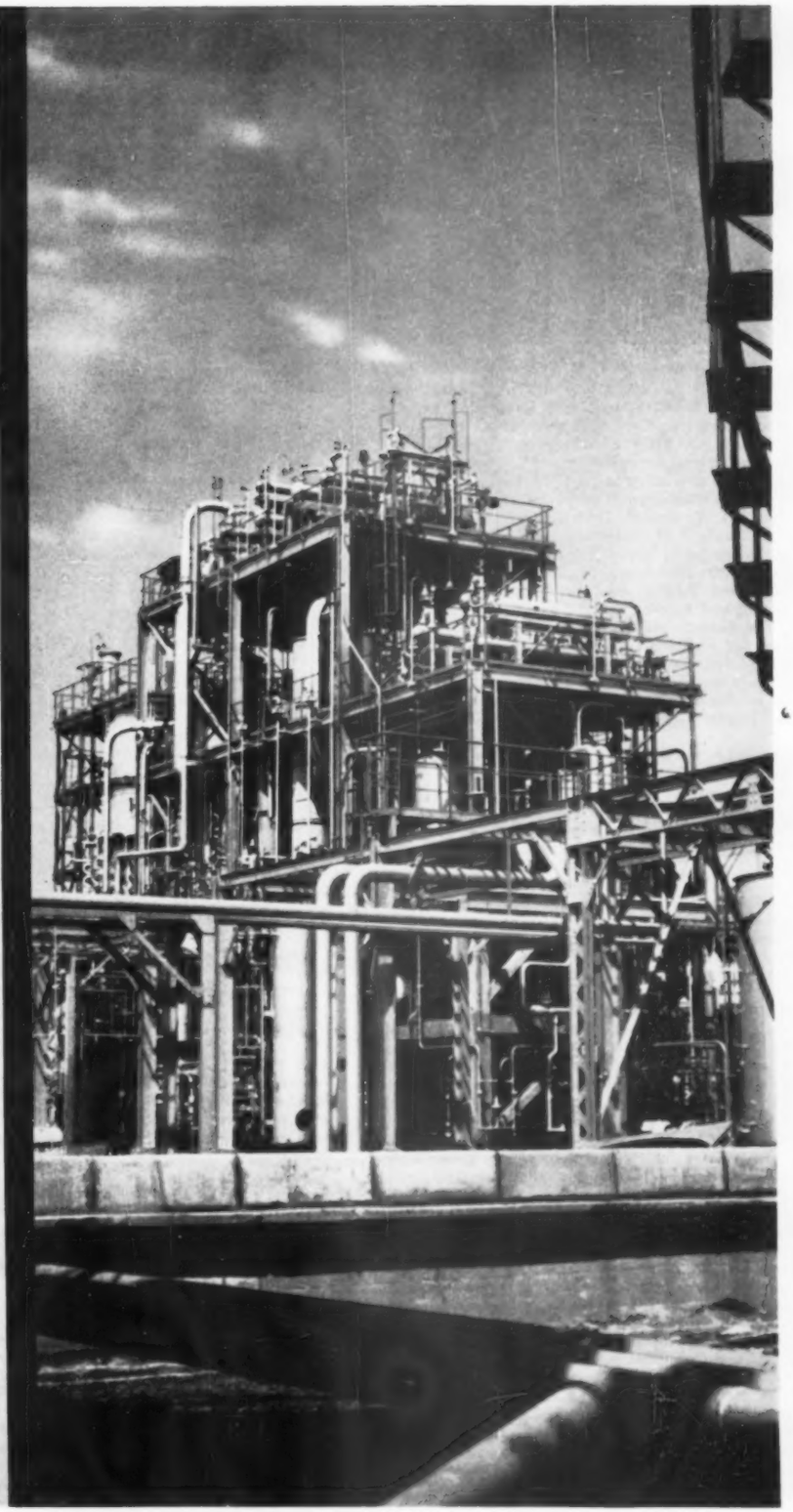

4.4 million pounds of 99% IPA and 7.7 million pounds of 99.5% acetone per year are produced at this plant designed by Stone & Webster from processes developed by The Distillers Company Limited and British Hydrocarbon Chemicals Limited. Further facilities for ethylene and butadiene production are now being designed by Stone & Webster.

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OIL COMPANY STAFF CHANGES

F. A. Davies

Norman Hardy

NORMAN HARDY, president, has been designated chief executive officer of Arabian American Oil Co., **FRED A. DAVIES** continues as board chairman. Seven Aramco vice presidents have been elected to the board in a move to bring field management into greater participation in board affairs. They are P. H. Arnot, T. C. Barger, R. I. ,Brougham, R. A. Eeds, R. S. Hatch, J. H. McDonald and L. M. Snyder. With the exception of Mr. McDonald the new directors, as well as Mr. Davies and Mr. Hardy, reside in Dhahran, Saudi Arabia, headquarters of Aramco's producing and refining operations.

The Aramco board as now constituted includes, in addition to the nine from Aramco, representatives of the four owner companies—Harvey Cash, The Texas Co.; H. W. Page, Standard Oil Co. (N.J.); G. L. Parkhurst, Standard Oil Co. of California; and Robert Siegel, Socony Mobil Oil Co., Inc.

RUSSELL B. BROWN plans to retire as general counsel of the Independent Petroleum Assn. of America on Dec. 31, 1959. It will round out his 30th year of representing the domestic oil and gas-producing industry in Washington. He began his association with IPAA in late 1929 on a "temporary basis."

GREER W. ORTON has been appointed assistant to the chairman of The Texas Co. Mr. Orton has been manager of The Texas Co. (Iran) Ltd., with offices in London. He was succeeded by H. H. Chandler, presently assistant manager.

WILBUR B. SHERMAN, has been elected president of Pan American Land & Royalty Co., Dallas, Texas. Formerly a vice president of DeGolyer & MacNaughton, Mr. Sherman has been associated with Standard California, Amerada, and Superior Oil in the past. For the past 10 years he has been with DeGolyer & MacNaughton, nearly half of this period being spent in Brazil where he was senior representative for the company while it was technical advisor for petroleum to the Brazilian government.

B. G. SYMON, manager of Shell Oil Co.'s industrial products department, has been named general sales manager for International Lubricant Corp., New Orleans, a Shell subsidiary, as of December 1. It manufactures and compounds greases and lubricating oils for Shell and the general trade. Mr. Symon served for several years as director of the subsidiary corporations.

T. W. KOCH, chief geologist of the foreign department of Superior Oil Co., and Leo van der Harst, senior geologist with the same department, have resigned to join E. B. Noble and Loyde H. Metzner to form the consulting firm of E. B. Noble and Associates, with headquarters in Los Angeles.

T. W. Koch

H. G. Mangelsdorf

HUGH HARVEY of the aviation department of Shell Oil Co., New York, has been transferred to Shell Petroleum Co., London, where he will be assigned to technical publication work in the public-relations department for the next three years.

Mr. Harvey is a native of England. He joined Shell Development Co. at its Emeryville, Calif., research laboratories in 1936, and during World War II was a process engineer with the British Petroleum Welfare Department for a period. For the past 10 years he has been with the aviation department, during which he has flown more than 600,000 miles in all parts of the world.

HARRY D. GASARCH has been elected comptroller of Mobil Overseas Oil Co. Inc., New York. In addition to his new responsibility, he will continue as an assistant comptroller of Socony Mobil Oil Co. Inc., with which Mobil Overseas is affiliated. He replaces E. J. Glocke, who has been granted a leave of absence pending retirement.

ROBERT F. BALDASTE has been appointed assistant manager of the organization department of Standard Oil Co. (Ind.) He was formerly administrative director of the Whiting, Ind., research laboratories.

RALPH P. LATIMER has been named assistant to the manager of production and exploration for the Lion Oil Co. Division of Monsanto Chemical Co. Mr. Latimer, who has been administrative assistant to Lion president T. M. Martin since 1952, will be stationed at production and exploration headquarters of the company in Houston, Texas.

JOHN E. ROTH has been elected a director and senior vice president of Tidewater Oil Co. Prior to his election, Mr. Roth had served as administrative vice president for production, in charge of coordinating Tidewater's domestic and foreign exploration and production activities.

DR. PAUL D. FOOTE, former vice president of Gulf Oil Corp., has resigned as Assistant Secretary of Defense, a post he has held since September 10, 1957. Acting Secretary of Defense Donald A. Quarles presented Dr. Foote with the Defense Department's Medal for Meritorious Civilian Service at a luncheon in his honor, October 27.

P. S. P. FELL has been appointed New York representative, crude-oil department of Gulf Oil Corp. **R. C. ARNOLD** has been appointed South American representative, crude-oil department. He will continue to maintain his offices in Rio de Janeiro, Brazil.

R. B. GUSTAFSON, Jr. has been promoted to assistant chief geologist of Delhi-Taylor Oil Corp. He will assist N. C. Miller, chief geologist, in the technical phases of foreign exploration in a staff capacity. **HUGO R. KAMB** has been named senior staff geologist for foreign operations.

J. G. COATES has been appointed manager, crude-oil supply-domestic, crude-oil department, of Gulf Oil Corp. He will be responsible for the purchase, sale, and exchange of domestic crude oils and for arranging the supply of such crude to Gulf's domestic refinery operations. He succeeds **C. H. OSBORNE**, who plans to retire within the next few months. **J. W. STREIT** will be assistant manager.

HAROLD G. MANGELSDORF, deputy coordinator of the worldwide refining activities of Standard Oil Co. (N.J.), has been elected a director of Esso Export Corp.

Mr. Mangelsdorf joined Jersey in 1934 as an engineer at the Baton Rouge, La., refinery of Esso Standard Oil Co. He later became assistant general manager of the refinery and, in 1950, was appointed general superintendent of the Esso Bayway refinery at Linden, N.J. In 1953, he was made general manager of manufacturing for Esso Standard, and was elected a director of that company in 1954 and a member of the executive committee in 1956.

In 1958, Mr. Mangelsdorf was appointed deputy coordinator of Jersey Standard's refining coordination department, a position he will continue to hold.

T. C. Borland

C. F. Bedford

ERRATUM

World Petroleum, November 1958, page 100, stated that Charles F. Bedford had been elected vice president in charge of production and a director of Pan American International Oil Co., New York, instead of Thomas C. Borland. Mr. Borland succeeds Mr. Bedford, who was recalled to Tulsa, Okla., as director and vice president in charge of production of Pan American Petroleum Corp., of which Pan American International Oil Co. is a subsidiary.

Employed by Pan American Petroleum Corp. since 1955, Mr. Borland held a variety of engineering and production assignments in Oklahoma and Texas until his appointment in July 1955 as production superintendent of Pan American's Canadian division at Calgary. A graduate of Cornell with an M.E. in mechanical engineering, Mr. Borland served in the US Navy from 1942-45, attaining the rank of lieutenant commander.

Pan American International Oil Co., organized to carry out oil exploration and development operations outside the North American continent, has been assigned full rights and interests in Iran for the exploration and development of a 6,177-square-mile offshore area in the northern part of the Persian Gulf. It also has been assigned concession rights in Libya totaling some 23 million acres.

P. T. BEE has resigned as executive vice president of Delhi-Taylor Oil Corp. to accept a management position with Murchison Brothers.

J. ED. WARREN has been elected chairman of the executive committee and member of the board of Cities Service Co., according to an announcement by W. Alton Jones, chairman. Mr. Warren resigned as senior vice president of the First National City Bank of New York, with which he has been associated since 1953. He assumed his duties with Cities Service, November 1.

OSCAR E. BRANSKY

Dr. Oscar E. Bransky, 72, former chief of the petroleum branch of the Economic Cooperation Administration and retired assistant general manager of manufacturing of Standard Oil Co. (Indiana), died Oct. 1, at Palm Beach, Fla. He retired from Standard in 1948 after more than 38 years' company service. He became a consultant for the Economic Cooperation Administration, and in 1950 was appointed by the ECA as chief of the petroleum branch of the Marshall Plan. He served for about four years in Washington, D.C., and Europe.

BEN H. VAN DER LINDEN

Ben H. van der Linden, 78, died while on a visit to Holland in October. He retired in 1940 as head of producing activities for the Royal Dutch-Shell group of companies. For many years he was in charge of exploration and production for Shell in the United States.

HOWARD A. GRIMES

Howard A. Grimes, 56, a retired director of Creole Petroleum Corp., died on October 27 at Mease Hospital in Dunedin, Fla. Mr. Grimes had been associated with the oil industry for 20 years. He joined Creole in 1922 as a field engineer, and remained with the company throughout his career except for short temporary assignments in New York and a period of four years (1945-49), when he was general manager of International Petroleum Corp. Ltd., in Peru. He was appointed a Creole director in 1951, and retired in 1953.

Mare tingerem si mercurius esset

An alchemist once boasted that if the sea were composed of mercury he could change it into gold. He would have used the philosophers' stone, or red elixir, which was credited with the power of transmuting several thousand times its own weight of mercury or other metal into the purest gold. The philosophers' stone is, of course, a catalyst (although not on the I.C.I. range!).

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INTERNATIONAL NEWS AND NOTES

Cancels Syrian Rights

UAR President Nasser has cancelled oil permits in Syria held by Syrian-American J. W. MenHall. Atlantic Refining and Portsmouth Steel hold 50% interest in the permits.

Gets Liberian Rights

Option on 1,500,000-acre concession in Liberia for oil and gas and other exploration has been awarded to Richard H. Robinson of Oklahoma City.

Nigerian Tests

An exploration well in Aba division of Ohuru in Nigeria went to 10,000 ft and found only traces of oil. An Aidde wildcat went to 10,544 ft; dry. This is northernmost well so far drilled by Shell-BP. Ohuru rig is being moved to Lubara Creek, Rivers province; while Aiddo rig will go to Imo River in Aba division.

Iraq Gas Injection

IPC will inject water from Iraq's Zab River at Dibis to maintain pressure in the Kirkuk fields.

Indonesian Survey

Mission from quasi-governmental Oil Resources Development Co. is Indonesia to survey oil development possibilities of northern Sumatra.

Czech Refining

Czechoslovakia's refinery capacity by 1965 is planned at 106,000 b/d.

Iraq Deep-Water Terminal

Iraq Petroleum Co. and associates have agreed to build a deep-water terminal at the head of the Persian Gulf to accommodate 100,000-ton tankers. Construction was to start in November. Completion of the terminal will allow considerable expansion of oil exports from Iraq's southern fields.

The government plans to increase oil exports from all fields annually to 57 million tons by 1961 from the current 31 million.

Iran Crude Output And Payments

Production of crude in southern Iran totaled 22.6 million tons in first seven months 1958, and is expected to reach record 40 million (803,397 b/d) for the year, an increase of about five million tons over 1957.

Iran's oil revenues from consortium operations for first six months of 1958 were $116 million—consisting of $31 million royalties; $83 million income taxes; and $3 million payments in kind.

Australian Results Encouraging

Oil and gas shows in Wapet's Meda No. 1 and Goldwyer No. 1 have encouraged operators to carry out additional work in Broome Ridge, Jurgurra Terrace, and Lennard Shelf areas.

Soviet Gas Field

A large natural-gas field has been reported in Turkmen republic, southern Russia, east of Caspian Sea.

Ivory Coast Wildcat

Drilling on a wildcat on the Ivory Coast is expected to go to 13,000 ft east of the town of Abidjan in the east-central part of a 2.4-million-acre concession. Operator, Ste. Africaine des Petroles, owns 51%; Plymouth Oil 39%; Benedum-Trees Oil Co. and M. L. Benedum each 5%.

Methane Ship Ready

The "Methane Pioneer," a ship jointly owned by the British Gas Council and Constock International Methane Ltd., is now fully converted to carry an experimental cargo of liquified natural gas across the Atlantic, and is about to undergo her trials in and around the Gulf of Mexico, it was announced by E. F. Battson, New York, president of Constock Liquid Methane Corp. After the trial runs, which will require some three months, the "Methane Pioneer," a converted dry-cargo ship, will sail early next year from Lake Charles, La., for the United Kingdom on the first three-week leg of her seven-week maiden voyage. It will be the first maritime transfer of liquefied gas for commercial purposes, and the first delivery will be made to the North Thames Gas Board at its Canvey Island marine terminal.

Constock Liquid Methane Corp. was formed in 1954 by the Union Stock Yard and Transit Co., Chicago, and Continental Oil Co., Houston. British Methane Ltd., the company formed by Constock and the British Gas Council, will operate the "Methane Pioneer." Upon delivery to the Canvey Island terminal, the liquid natural gas will be converted to gas under pressure, and then delivered by direct transmission line to the Thames Gas Board's Romford works for reforming and subsequent delivery to consumers. The "Methane Pioneer" was converted by the Alabama Dry Dock and Shipbuilding Co., Mobile, Ala., and the first shipment of gas will be drawn from an experimental Constock liquefaction plant and storage terminal at Lake Charles.

Nigeria Appoints Advisor

Nigeria has announced it will appoint a Petroleum Adviser to deal with applications from oil companies for exploration and drilling rights.

Crude-oil production in Nigeria for the year 1958-59 is estimated at 6,000 b/d, or 2,191,000 bbl a year. On this, royalty payments would be 65,000 pounds. Officials say 122,239 long tons of crude oil were exported between mid-February, when the first shipment left, through the end of July.

Jordan Oil Refinery

An agreement to build an oil refinery in Jordan has been signed at Amman by Snam Progretti, an Italian concern, and the Jordanian authorities. The refinery, which will cost £3.52 million (US $9,855,000), will have 350,000 tons annual capacity (7,000 b/d) and is due for completion in two years. Situated near Zerka, 15 miles north of Amman, the refinery will draw its crude oil from the Trans-Arabian pipeline running through Jordan to Lebanon. This project has been discussed for many years.

Oil In USSR Growing

The latest Soviet 7-year plan will greatly speed up the shift in the national economy from coal to liquid and gaseous fuels. Soviet crude-oil production this year is likely to exceed the original target of 111.8 million (2-236,000 b/d) by 2 to 3 million tons, and at the current rate of growth it should double within seven years. Current natural-gas output is at an annual level of 305,000 million cubic feet, and by 1965 it should be around between two to three times this figure. This will make possible a radical change in the fuel balance at home and continued increase in Soviet oil sales abroad.

Defers Pan Arab Meet

Arab League's political committee in Cairo has announced fifth postponement of Pan Arab Oil Congress, to April 1959.

Romanian Chemicals

Radio Bucharest reports early operation of Romania's first petrochemical plant to process refinery gas at Brazi, 50 miles from Bucharest.

Saudi Arab Rigs

Aramco expects to have five rigs operating in Saudi Arabia during 1958, and plans to complete 27 wells this year.

Iraq Gas Use

Iraq's development board plans utilization of natural gas from Rumaila field for power and for fertilizers. 30-mile pipeline would have to be built.

Levy To Visit Italy

Walter Levy, USA oil economist, is to visit India shortly on invitation from Morarji Desai during a recent visit to the USA. Mr. Levy will advise on private participation in India's oil industry. His mission is entirely separate and not related to the visit of Mr. Enrico Mattei, chairman of Italy's State-owned oil corporation, ENI, who is to head up a team of petroleum specialists from Italy due in India shortly to advise the government about its oil exploration program. Mr. Mattei and K. D. Malaviya, India's Minister for Mines and Oil, discussed the visit at Zurich and discussed ENI's offer of collaboration in the establishment of a second public-sector petroleum refinery at Barauni in Bihar.

Iran Still Open

Nonassigned zones of Petroleum Districts No. 1, 3, and 4 in Iran remain open under the Petroleum Law, according to the National Iranian Oil Co. District No. 1 includes the continental shelf of the Persian Gulf. Districts No. 3 and 4 are in the south of Baluchistan from the Straits of Hormoz to the Pakistan border. The districts were opened to public bidding in February and March of this year.

In District No. 1, some 16,000 square kilometers have been granted to the Irano-American Co. (IPAC) formed under the Pan American Agreement, and 5,600 square kilometers have been granted to the Irano-Italian Co. (SIRIP) under the AGIP agreement. About 47,000 square kilometers of district No. 1 remain available. District 3 and 4 total about 100,000 square kilometers. In District 3, some 6,000 square kilometers have been allocated to SIRIP and about 1,000 square kilometers to the joint Irano-Canadian firm, Sapphire.

The areas remain open until NIOC publicly announces they are closed, and gives three months notice.

Belgian Taxes Down

By royal decree, Belgium has reduced from 5% to 0.50% the transmission tax on gaseous products from oil refineries sold to firms for production of chemical products other than propane and butane. The reduction, effective September 30, 1958, is until the end of 1962.

Europe's Atomic Future

J. H. Louden, director of the Royal Dutch Petroleum Co., estimates that by 1975 atomic energy will account for only 7% of western Europe's energy needs. Coal will contribute 50% and oil 32%, he estimates. He calls it a "general misconception" to believe atomic energy will "liberate" Europe from its reliance on oil, adding it will "complement" oil and coal sources. He feels the Middle East is coming to believe that she needs the western oil market, just as the West needs her oil, adding "this mutual dependence" provides "a certain guarantee" for continued flow of Middle East oil to Europe.

New Kenya Concession

Frobisher Ltd., which has held an oil prospecting license in northeast Kenya for the past 18 months, has acquired exclusive oil exploration rights on 8,000 square miles in Kenya and 70,000 square miles in Somalia. A company field party began work in northeast Kenya, September 26.

French Sign With Argentinians

YPF, Argentine oil enterprise, and a French group have signed protocol for $70 million credit to YPF for financing oil equipment and services. Signing for French were representatives of French Petroleum Inst., IMPEX, Banque Française de Commerce Exterieur, Banque de Paris et des Pays-Bas, and Banque de l'Union Européene Industrièlle et Financière. Payment for equipment and services delivered reportedly will be spread over five-year period from delivery. Agreement is result of letter of intent signed August 1958.

Two More Nigerian Finds

BP-Shell group has found oil in two more Nigerian wells—one at Krakrama (Degema Division) and the other at Ebubu (Ogoni Division). Further tests will determine significance of the new finds.

"HEY! MIKE... *tell 'em up at the office we made schedule—bang on the nose! And Mike, do me a favour. Send my regards to the boys who built that diesel. We could do with a lot more of 'em around here!"*

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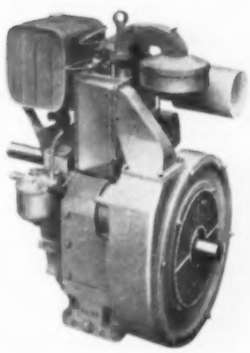

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British Somaliland Survey

BP Exploration Co. will shortly resume its geological survey in British Somaliland on its 6,000-sq-mile coastal strip between Berbera and northwestern border.

Work Begins On Wales Line

Work has begun on what will be Britain's longest crude pipeline when it is completed by year-end 1959. 60-mile 100,000 b/d line will run across southern Wales, linking BP's new deep-water terminal being built at Milford Haven to BP's Llandarcy refinery.

Iraqi Oil Revenues

Iraq government has announced receipt of 21,890,000 Iraqi dinars in oil royalties for third quarter 1958, and expects fourth-quarter payments to rise by two million dinars because of increased output from northern and southern fields.

Shell Joins In Australia

Negotiations whereby a Royal Dutch-Shell Co. would acquire an interest equal to each of those of California Asiatic Oil Co. and Texaco Overseas Petroleum Pty. Ltd. are under way. West Australian Petroleum Pty. Ltd. holds exploration permits over nearly 300,000 square miles in Western Australia, and the venture has already cost more than £14,000,000 (US $31.4 million). This new arrangement will give Shell another opportunity to participate in the continuing endeavor which is being made to find oil in Australia. Relative to each other, the proportionate interests of California Asiatic Oil Co., Texaco Overseas Petroleum Co., and Ampol Exploration Ltd. in the venture will not be affected; Ampol Exploration Ltd. will hold one-seventh and the others two-sevenths each.

Start Rotterdam Construction

First piling recently was driven for the new $50 million Esso Nederland NV refinery in Rotterdam. When completed in 1960, capacity will be in the neighborhood of 95,000 b/d or 4,500,000 tons a year of crude. To be located in Rotterdam's Botlek area, the new refinery will supplement the supply from Esso's refinery in Antwerp. Principal contractor for engineering and construction is Badger-Comprimo NV of The Hague. (Badger-Comprimo is owned jointly by Badger Manufacturing Co., Cambridge, Mass. and Comprimo NV, Amsterdam).

Site of the refinery is 425 acres between two arms of the Third Petroleum Harbor, west of the Old Meuse. Its plot contains ample storage areas for both crude and refined products, as well as room for future expansion. In addition, the refinery will have a mile of modern waterfront facilities—including piers capable of loading three supertankers at once—and loading stations for trucks and tankcars.

Greek Refinery Contract

Socony Mobil Oil Co. Inc. and Hydrocarbon Research Inc. are third parties to a contract for the lease, operation, and supply of the Greek government's oil refinery at Aspropyrgos. Main parties are the government and the Transportation, Trade, and Refining Oil Co.

The contract is for 10 years and Transportation is required to deposit $1 million letter of guarantee. Rental and depreciation payments to the government are set at 90.5% of net annual profit. Greek government reserves the right to supply crude oil equal to 30% of the plant's import capacity, which is 30,000 bbl per working day.

Transportation must set up in three months a Greek company, and shareholders of this company will be: Bodosakis Athanasiades 43%; Stavros S. Niarchos 43%; Socony Mobil Oil Co. 10%; and Dimitrios A. Carapanos of Hydrocarbon 4%. Equity capital of $1.6 million must be paid in full within one month of company's formation. Transportation is obliged to employ capable foreign personnel, but must reduce the number from 60 in the first year to no more than 10 in the fourth year and thereafter.

Discovery In Libya

Oasis Oil of Libya's Ohio Oil Co. No. B1-32 Dahra, located 24 miles south of the company's initial Libyan discovery, had 38 bbl of 36-degree-gravity oil with no water in an hour and 15 minutes on a drillstem test. The exploratory well tested an interval from 3,758 ft to 3,808 ft in a limestone formation. Oasis Oil is held in undivided one-third interests by Ohio Oil, Amerada Petroleum Corp., and Continental Oil Co.

The apparent discovery is on the south end of the same block in which Oasis Oil of Libya's No. 1 Bahi tested 75 bbl of 39-degree-gravity oil in 2½ hours late in June. The interval tested in the first well was considerably lower, a 32-ft sandstone section from 5,822 ft to 5,854 ft. It is evidently a different formation.

New Bahamas Concession

Siebens Leaseholds Ltd. of Calgary, Canada, has acquired concessions on approximately 300,000 acres of islands and offshore areas in the southeast portion of the Bahama Islands. One of the larger islands, San Salvador, was Columbus' landfall on his discovery of the New World. Other island and cays included in the permits are Conception, Mariquana, and Little Inagua Islands; also Rum, Samand, and Plana Cays.

Kuwait Exports

First eight months 1958 crude exports of Kuwait Oil Co. totaled 302,627,763 bbl. Product exports included 3,453,946 bbl distillates; 483,935 diesel; 3,426,901 gas oil; 3,385,671 heavy fuel oil; 692,474 light fuel oil. Chief destination of crude was United Kingdom, followed by USA.

Italian Crude Line

Italy's public works ministry has received plan for laying 210-mile crude pipeline along proposed railway from Venice to Munich, Germany to carry Middle East crude from port of Venice or Trieste to Middle Europe.

To Explore Eire

Early approval of oil and gas exploration concession over entire republic of Ireland is expected by Messman-Rinehart Oil Co., Wichita, Kans., and Ambassador Oil Corp., Dallas, Texas. Negotiations have been by Medonna Oil Co., Messman-Rinehart Irish subsidiary; Ambassador is to have operating interest.

3RD QUARTER NET TRAILS 1957

Average decline in net earnings of oil companies in the third quarter of 1958 was about 4.4% under the same period last year. For the third quarter of 1958, some companies registered a gain over 1957, with a few scoring their best quarter of the year.

The following tabulation gives earnings for the third quarter of 1958, and for the nine months ended September 30 as well, inasmuch as some companies have published their earnings statements on a nine months' basis only.

OIL-COMPANY EARNINGS 3RD QUARTER AND NINE MONTHS 1958
(Thousands of Dollars)

	NET INCOME				PER SHARE OF COMMON			
	9 Mos. September 30		3rd Quarter		9 Mos. September 30		3rd Quarter	
COMPANY	1958	1957	1958	1957	1958	1957	1958	1957
Argo Oil Corp.	3,757	4,125			1.92	2.10		
Anderson Prichard	2,757	4,075	1,380	1,255	1.48	2.28	.77	.69
Arkansas Fuel Oil	4,701	5,917	1,378	1,993	1.24	1.56	.36	.53
Ashland Oil & Ref.	10,332	16,219	2,977	3,393	1.51	2.52	.45	.52
Atlantic Ref.	19,180	29,337	11,513		2.02	3.15		
Aztec Oil	1,325	720			.55	.30		
Bankline Oil	17	414	204	76	—	—	—	—
Barber Oil	210	17			—	.02		
Bishop Oil	98	161	53	18	.18	.29	.10	.03
Cities Service	32,312	45,656	7,693	9,340	3.07	4.43	.73	.91
Clark Oil & Ref.	639	1,084			.45	.77		
Colon Oil	2,697	2,210	1,147	1.024			—	.17
Colorado Oil & Gas	(d) 110,558	(d) 706	685					
Continental Oil	33,294	34,862	13,086	11,148	1.69	1.78	.66	.57
Creole Petroleum	249,018	318,807	88,105	97,159	3.21	4.11	1.14	1.25
Delhi Taylor Oil	(d) 1,056	4,340						.82
Eastern Gas & Fuel	3,442	9,510	172	2,067	.93	3.17	—	.65
Felmont Petroleum	1,503	2,645	561		.41	.75		
Getty Oil Co.	12,557	15,519			.77	.95		
Gulf Oil Corp.	204,383	276,212	88,513	74,457	6.31	8.53	2.74	2.30
Hancock Oil	4,791	5,385			1.26	1.42		
Honolulu Oil Corp.	8,595	11,290	3,010	3,674	2.29	3.01	.80	.98
Imperial Oil	34,327	58,421	10,174		1.09	1.85		
Int'l Petroleum	19,600	33,100	6,700		1.35	2.28		
Louisiana Land & Expln.		4,114	5,103				.46	.57
McColl Frontenac	7,120	11,152	2,817	4,041	2.16	3.41	.86	1.24
MacMillan Petroleum	14	90			.01	.09		
Maracaibo Oil Expln.	218	814	80	113	.45	1.64	.16	.23
Midwest Oil Corp.	5,003	5,187			1.98	2.04		
Mountain Fuel Sup.	2,258	2,672			1.03	1.22		
Ohio Oil Co.	23,028	32,007	7,941		1.75	2.44	.60	.75
Phillips Petroleum	57,609	74,227	21,198	20,829	1.68	2.16	.62	.61
Plymouth Oil	2,876	5,654	1,356	1,249	1.15	2.29	.54	.51
Pure Oil Co.	17,416	26,147	6,741	7,135	2.02	3.04	.78	.83
Quaker State Oil Ref.	1,340	1,590	529	633	1.62	1.93	.64	.77
Richfield Oil Corp.	15,265	21,774	4,856	8,069	3.82	5.44	1.22	2.01
Sinclair Oil Corp.	35,367	62,879	10,560		2.30	4.11		
Sinclair Venezuelan Oil	17,002	6,163	5,909		4.25	1.54		
Skelly Oil Co.	17,544	28,231	6,995	8,298	3.05	4.91	1.21	1.44
Socony Mobil Oil	171,700	174,800	48,200	48,000	2.39	3.69	.99	.99
Shell Oil Co.	78,289	105,797	32,637	30,477	2.58	3.49	1.08	1.01
Signal Oil & Gas	8,420	9,287	2,760	3,151	1.68	1.85	.55	.63
Standard Oil of Cal.	187,743	211,765	71,008	75,436	2.97	3.35	1.12	1.19
Standard of Ind.	86,449	113,872	34,026	31,296	2.42	3.21		
Standard of Ky.	10,442	9,559			4.01	3.67		
Standard of Ohio	17,474	14,581	6,038		3.50	2.90		
Standard of N.J.	462,000	660,000	171,000	197,000	2.26	3.35	.83	1.00
Sun Oil Co.	22,622	39,013	11,062	13,826	1.98	3.63	.97	1.29
Sunray-Mid Cont.	28,080	36,011	8,749		1.46	1.92		
Superior Oil of Cal.†	16,551	18,877			39.20	44.71		
The Texas Co.	227,693	243,104	89,157	77,958	3.90	4.43	1.53	1.42
Texas Gulf Prod.	2,524	4,960			.63	1.28		
Texas Pacific Coal & Oil	4,166	5,515	1,813	1,566	1.08	1.53	.47	.43
Tide Water Oil	(d) 328	27,001	(d) 607	5,432	(d) .19	1.87		.35
Union Oil of Cal.	20,830	27,676	9,373	10,949	2.65	3.52	1.19	1.39
Union Oil & Gas of La.	5,745	4,542	1,654		3.15	2.49		
Universal Cons. Oil	1,928	2,740	804	813	2.01	2.86	.84	.85
Woodley Petroleum	2,034	2,546	753	797	2.48	3.10	.92	.97

† Year ended Aug.

looking for oil

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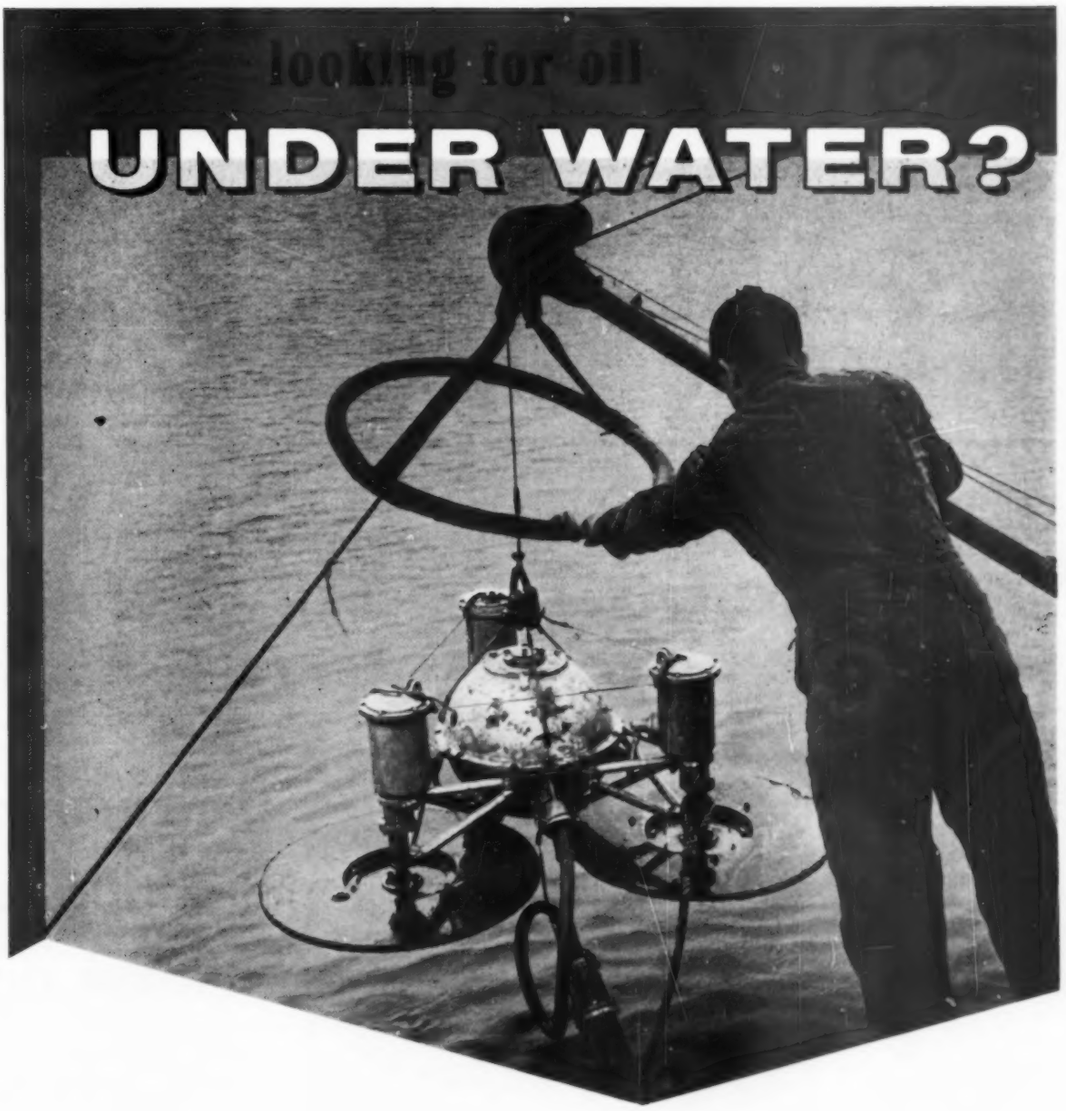

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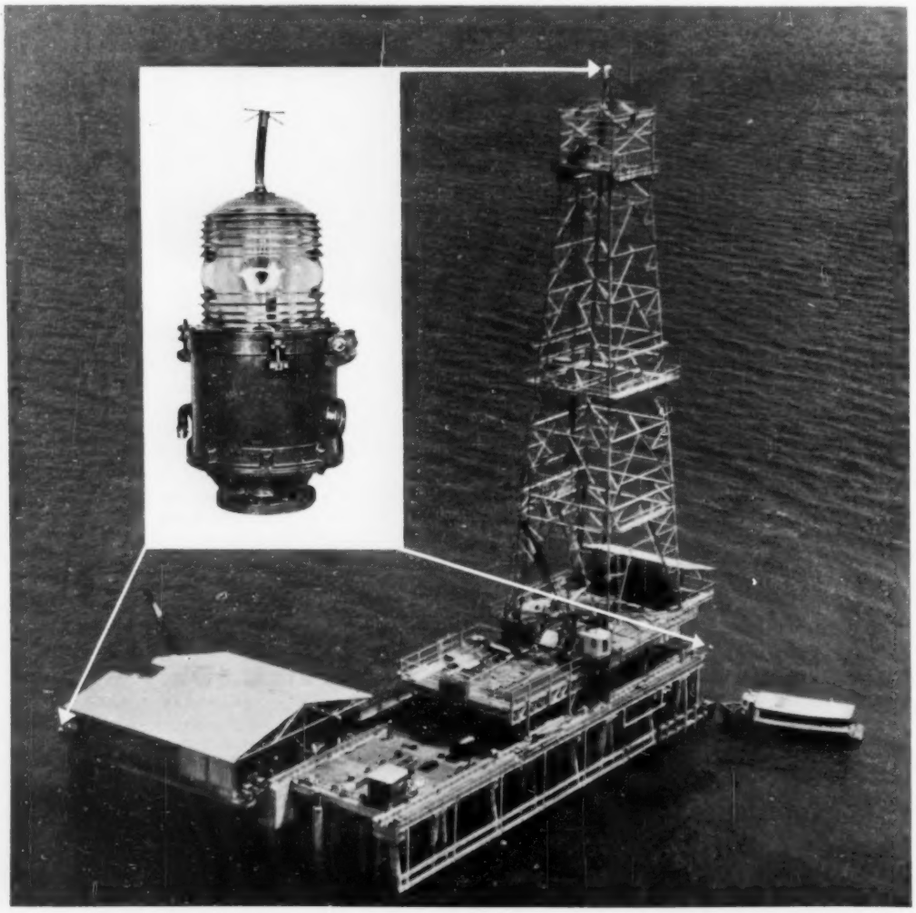

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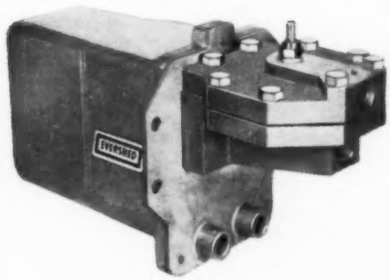

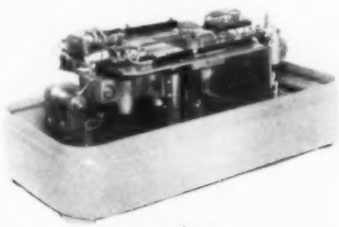

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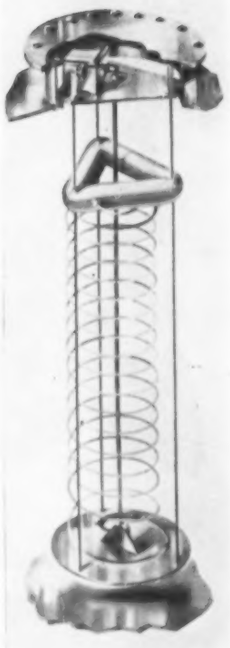

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Washington Pipe Line

(Continued from page 5)

Expect Memphis Case Decision

The US Supreme Court is expected to hand down a decision late this year on the Memphis case, the most important natural-gas case since the Phillips decision of June 7, 1954. The court heard three hours of argument on the matter, an unusually long argument, on October 20 and 21, with the Department of Justice this time on the side of the United Gas Pipe Line Co., and the bulk of the gas industry.

J. Lee Rankin, Solicitor General of the United States, arguing for the Federal Power Commission, said that a lower court ruling for Memphis, if sustained by the high court, would mean "grave inequities" which would "ultimately hurt the consumer." In this case, United had filed with the FPC its proposed higher rates to scores of customers, and the FPC had approved the higher rates. Memphis went to the US Court of Appeals, however, and argued that the sales contract specified the price at which the sales should be made, and these could not be changed unless all the customers agreed.

Under Sect. 5 of the natural-gas act, the FPC may study gas rates and find if they are "just and reasonable," but this would take "18 months to six years" to complete. Under the usual route, Sect. 4, the gas company files a higher rate and can put it into effect after six months, subject to refund if the FPC disallows some or all of it.

Elk Hills Crude

The US Navy, which faces trouble selling its crude oil from the Elk Hills Naval Petroleum Reserve, is completing details of an exchange deal with Standard Oil Co. of California. Capt. A. S. Miller, director of Naval Petroleum Reserves, faced with a situation of too much crude on the West Coast, offered three million barrels of crude from Elk Hills in exchange for residual fuel.

Standard of California was the sole company to bid on the exchange. It offered 4,035,000 bbl residual. The Navy calculated the residual oil is worth $7,800,000 at the current market prices. On the basis of present production rates, the exchange could take six or seven months. The exchange would start January 4, and the final award is to be made early in December.

Imports Hold-the-Line

Congressional leaders are closely watching the working of the program to limit oil imports to the USA, amid signs they will press for mandatory curbs on imports unless the program works on a voluntary basis. Congress is unlikely to take special legislative action with regard to oil imports in the coming year, even if imports come in over and above what is allowed under the voluntary program. Instead, leaders in Congress are likely to insist the administration do whatever is necessary to hold the line, even if this means a mandatory program.

Leaders in Congress point out that House Speaker Sam Rayburn and Senate Majority Leader Lyndon Johnson were given ironclad promises from high administration leaders that effective steps would be taken to curb oil imports. On these promises, the two Texans went to bat for the administration's reciprocal trade agreements program a few months ago.

The cabinet committee on oil imports, thus, faced fire from two directions as it considered a review of the current shape of the program to become effective January 1, 1959. On the one hand, the committee faced a real threat that congressional leaders would insist on mandatory action unless it could come up with a program oil importers would accept on a voluntary basis. On the other, the committee heard threats from some major importers that they would refuse to go along with the program, unless it treated them fairly and gave credit to a campaign history of imports.

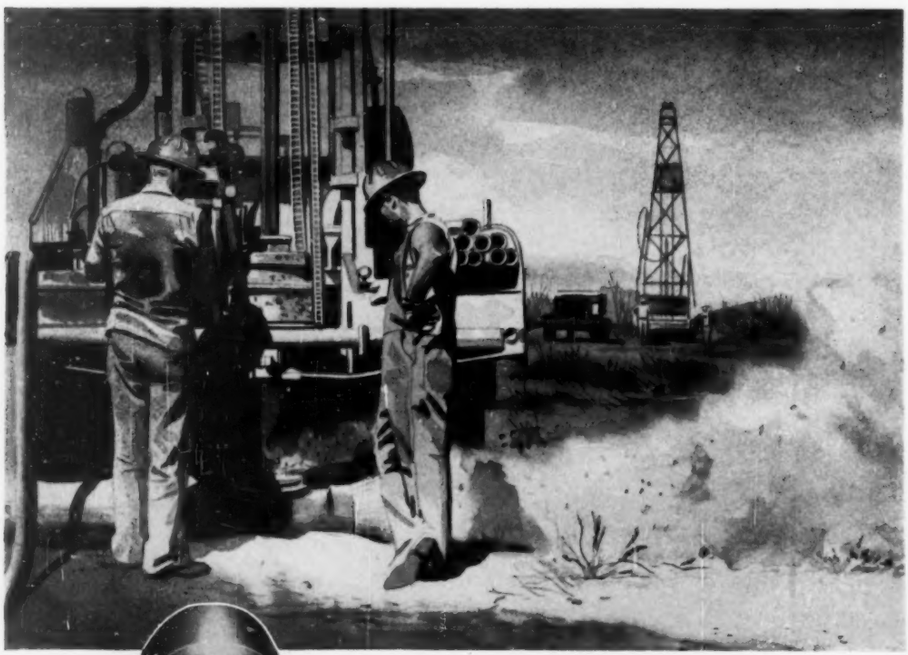
So, the cabinet committee decided upon, as one member calls it, "a rolling readjustment" from the original proposal of Navy Captain M. V. Carson, Jr., oil imports administrator. The Carson plan would have allowed import quotas on the basis of a company's refinery runs, without regard to the history of the company's imports or its foreign investment; and without regard to whether a refiner was physically and economically able to use the imported crude.

The cabinet committee, meanwhile, came under the direction of a new man, starting November 11, when Admiral Lewis L. Strauss took over as Secretary of Commerce. The Secretary of Commerce is chairman of the cabinet committee on oil imports. Mr. Strauss was named to succeed Sinclair F. Weeks of Massachusetts, who resigned as of November 10. Mr. Weeks' departure leaves only three members of the original Eisenhower cabinet still serving in Washington. Mr. Strauss is a different type of man from Mr. Weeks. While the Massachusetts businessman, one of the wealthiest men in the cabinet, was content to let the oil program be handled by others, Mr. Strauss is a man who tends to dominate anything over which he has control. Thus, he is likely to crack the whip with regard to oil imports.

Under Secretary Weeks, Herbert Hoover, Jr., consultant to the State Department and former Secretary of State, and Robert B. Anderson, Secretary of the Treasury, have called the shots with regard to oil-import programs. Mr. Weeks went so far as to delegate his functions to Frederick H. Mueller, his assistant secretary, and now Undersecretary of Commerce. As chairman of the Atomic Energy Commission, Mr. Strauss was in constant hot water with congressmen, partly because he stuck to doing things the way he saw fit and partly because of honest differences of opinion. In the new post, he is likely to be fully as stubborn when he feels he is right.

USA Gas Importer

The USA, which changed to a net importer of petroleum some years ago, appears to be headed for the same situation in natural gas. For years, the USA has been a net exporter of natural gas, with exports to Mexico and Canada well in excess of imports from those countries. By 1956, however, the net exports were down to 25,583 million cubic feet. By 1957, they dropped to 3,714 million cubic feet. And with plans afoot to bring in more Canadian gas, and with stepped-up imports from Mexico, the



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shift to a net importer is seen as likely very soon.

The overage of exports is a very small percentage of total gas marketed in the USA last year, which was 10,680 billion cubic feet, a gain of 6% over 1956. The figures are from US Bureau of Mines.

Here's the balance sheet on USA imports of natural gas from Canada and Mexico and of USA exports of gas to these countries in the past two years.

	1957	1956
	(Millions of Cubic Feet)	
USA imports from Canada	20,971	10,374
USA imports from Mexico	16,970	6
Total	37,941	10,380
USA exports to Canada	30,867	16,819
USA exports to Mexico	10,788	19,144
Total	41,655	35,963
NET EXPORTS	3,714	25,583

The rise in USA imports from Mexico came with the start of Texas Eastern Transmission Corp.'s new project relying on Mexican natural gas. Imports by Pacific Northwest Pipeline Corp. are reflected in the rise in imports from Canada. END

PGAC And SSC Cooperative

Perforating Guns Atlas Corp., Houston, will offer the continuous velocity logging and seismic calibration services under an arrangement with Seismograph Service Corp., Tulsa. The services will be integrated with electrical, induction, and nuclear logging facilities, and complete perforating and other wire-line completion services of PGAC. These integrated services are already available in the Texas, Louisiana, and Oklahoma oil fields, and will be extended to PGAC's other service areas as soon as possible.

Both companies will continue to offer their independent services as heretofore—SSC from its stations in the USA, Canada, Venezuela, England, and France; and PGAC from its stations in the USA, Canada, Venezuela, Bolivia, and West Germany.

En-Tronic Pipeline Control

A new engineering application bulletin on automatic controls for engines and compressors has been prepared by The Cooper-Bessemer Corp., Mount Vernon, Ohio, as *Bulletin 87*. The bulletin, entitled "En-Tronic Pipeline Control" describes equipment for automatically starting, loading, capacity control, regulating, and shutting down pipeline compressors. The "En-Tronic Control" equipment also applies to other types of power machinery such as gas, diesel and gas-diesel engines, as well as motor-driven reciprocating and centrifugal compressors commonly used for gas-processing and air services.

Griffin Named At Security

Claude L. Griffin has been appointed sales manager, United States and Canada, for Security Engineering, manufacturer of rock bits and other oil-well drilling tools. Most recently Griffin was vice president of American Iron and Machine Works Co., in charge of that firm's international sales.

C. L. Griffin

M. W. Reed

Halliburton Hemisphere Manager

M. W. ("Cy") Reed has been promoted to foreign operations manager—Western Hemisphere, for Halliburton Oil Well Cementing Co, Creation of the new supervisory post has been announced by Ralph R. Emery, vice president for foreign operations and export sales.

The new manager has been in charge of Halliburton's Canadian subsidiary since 1948, and had earlier spent seven years in foreign oil fields. He will move from Calgary, Alberta, to the company's Duncan, Okla., headquarters.

British Raymond International

Raymond International Inc. (formerly Raymond Concrete Pile Co.) has formed Raymond International (UK) Ltd., a wholly owned subsidiary—with headquarters in London—according to announcement of George F. Ferris, president. The new company will offer a range of engineering and construction services to clients in the United Kingdom and other sterling currency areas such as the Commonwealth nations, colonies, and protectorates.

Nuclear Products Division

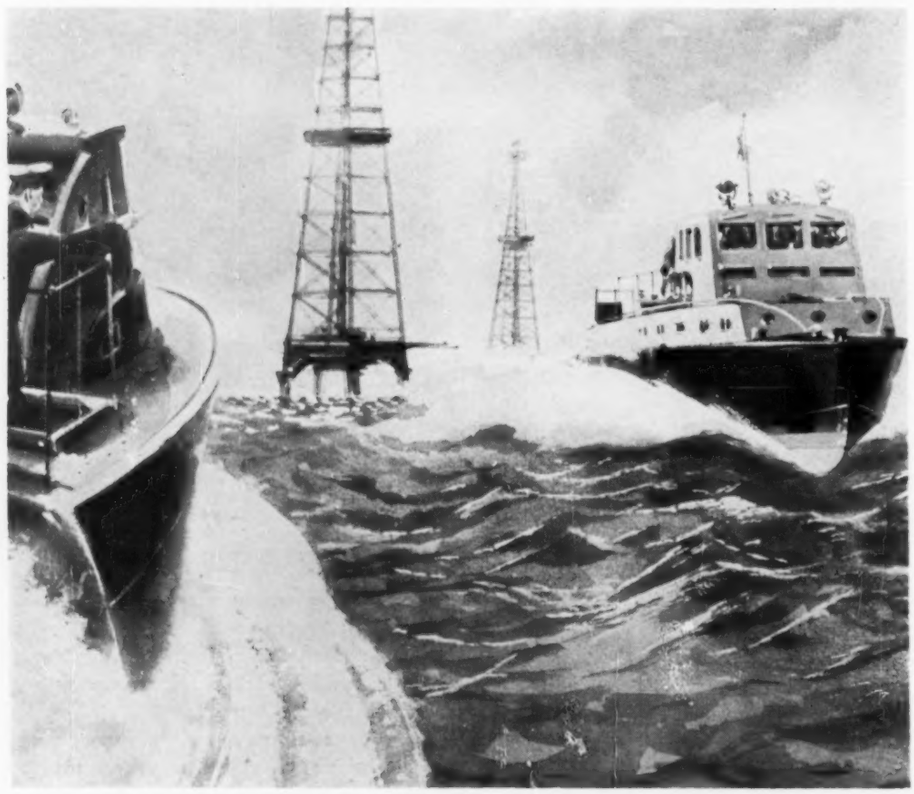
Formation of a nuclear products department has been announced by F. W. Laverty, executive vice president of Clark Bros. Co. Division of Dresser Industries Inc.

Chemical Plant By Kellogg

A contract for construction of an activated adsorbent clay plant has been awarded The M. W. Kellogg Co., New York. The plant will be located at Weeks, La. Construction work has begun, and the plant is scheduled for December 1958 completion.

Dowell Foreign Offices Opened

Dowell Inc. is establishing foreign operations offices in Houston under the management of L. B. Swan, vice president. Mr. Swan formerly was assistant general manager at Tulsa, and was in Venezuela for two years. Manager for Latin America will be Tromer R. Smith, who has been manager for United Oilwell in Venezuela since 1952. He is to be succeeded in Venezuela by Basil A. Hodges.



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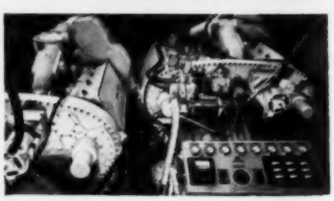

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CRC D39

P. L. Myers

E. M. Connor

O. B. Latrobe

R. G. Roberts

Hughes Changes In Personnel

Reorganization of Hughes Tool sales personnel has been announced by M. E. Montrose, vice president-sales.

Park L. Myers has been made manager of United States and Canadian sales, and E. M. Connor manager of export sales. Both are under W. H. Siems, general sales manager. Export sales activities have been divided into Western and Eastern Hemisphere territories, with O. B. Latrobe, New York, heading Western Hemisphere sales and R. G. Roberts, London, Eastern Hemisphere sales.

Leon Stinson moves to Houston as director of sales training. J. R. Lesch moves to Houston as manager-rock bit sales. R. W. Lewis becomes manager-tool joint sales.

Throughout the United States and Canada new regional and divisional organizations have been added or realigned to furnish improved service. Seven new regional headquarters with respective managers have been added as follows: Dallas, T. G. Whiddon; Houston, W. W. Hampton; Denver, S. J. Lintzenich; Midland, M. A. Foreman; New Orleans, F. T. Alexander; Tulsa, E. M. Kelley; and Canadian, R. D. Hood.

L. B. Stinson

J. R. Lesch

R. W. Lewis

G. L. O'Connor

O'Connor With Clark Bros.

Appointment of George L. O'Connor to a newly created post for the promotion and sale of gas turbines in the eastern half of the USA has been announced by Clark Bros. Co. Division of Dresser Industries. Mr. O'Connor comes to Clark Bros. from Houston, where he was formerly equipment engineer for the Lummus Co.

You're Paying for W-S Quality . . .

BE SURE YOU GET IT!

W-S Forged Steel Fittings fit the pattern of all top quality products. The best costs no more in the long run. In terms of trouble and inconvenience, second-best will always be expensive. These are the reasons why you are money ahead to insist on C-1025 W-S Fittings.

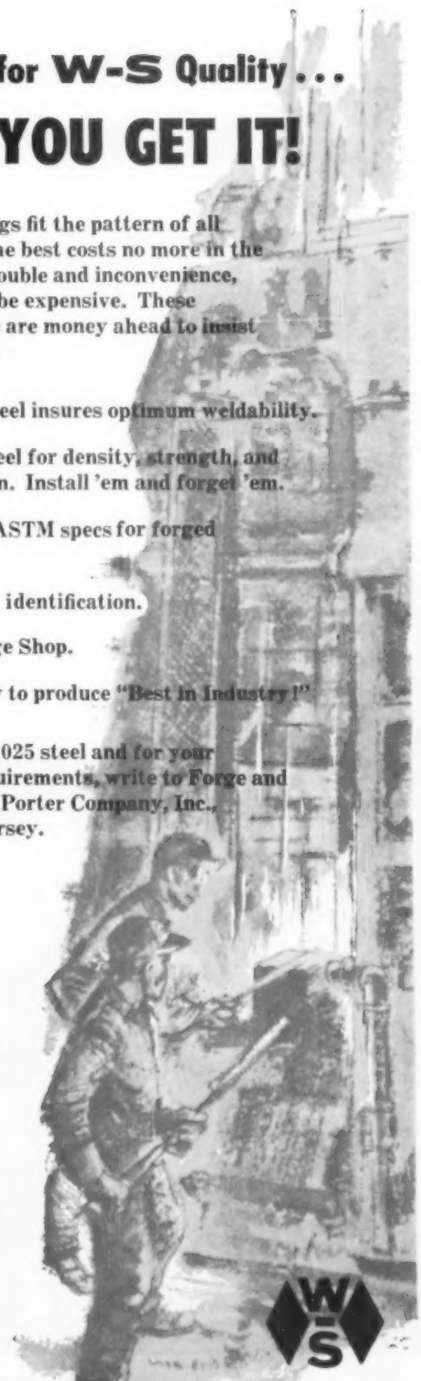
- **Low carbon C-1025 steel insures optimum weldability.**
- **Special bar quality steel for density, strength, and consistent composition. Install 'em and forget 'em.**
- **Steel physicals excel ASTM specs for forged steel fittings.**
- **Heat coded to insure identification.**
- **Made in our own Forge Shop.**
- **Full control of quality to produce "Best in Industry!"**

For information about 1025 steel and for your commercial forging requirements, write to Forge and Fittings Division, H. K. Porter Company, Inc., Box 95, Roselle, New Jersey.

ROUGH FORGING BEFORE TRIMMING

ROUGH FORGING AFTER TRIMMING

FINISHED FITTING



H. K. PORTER COMPANY, INC.

FORGE AND FITTINGS DIVISION

W-S Fittings Works, Roselle, N. J. • Cleveland Forge Works, Cleveland 4, Ohio
Stainless Steel Works, Duncannon, Pa.

The world's largest oil barge is shown being launched at the Bethlehem Shipyard in Beaumont, Texas. Christened the "Ethel H," the 300-ft vessel will be a substitute for a pipeline to serve a new refinery Hess Inc. is building at Sewaren, N.J. The barge will move crude and oil products from various East Coast terminals to the refinery, and finished products from the refinery to distribution points. The huge barge is 300 ft long, and it has a beam of 65 ft. It draws 22 ft of water when fully loaded. According to Bethlehem Shipyard, this is the largest oil barge ever built. Its capacity is 62,000 bbl, which is about equal to four average-size barges.

Heads Schlumberger In S.A.

R. D. Ford has been named president of Schlumberger Surenco SA. As chief of the Schlumberger company which operates in South America, he will continue to maintain headquarters in Caracas.

A 1936 graduate of Stanford University with a mechanical engineering degree, Mr. Ford joined Schlumberger upon graduation. He has held a number of posts in various parts of this country, including assistant area manager in California and the Gulf Coast, and area manager for the Mid Continent area. He has been executive vice president of Schlumberger since 1952.

Chiksan Brochure

Chiksan Co., Brea, Calif., has now available a new 24-page catalog for the petroleum industry. Designated "P-8," the catalog incorporates some of Chiksan's newest products, including the 15,000-lb test Longsweep joint for cementing.

R. D. Ford

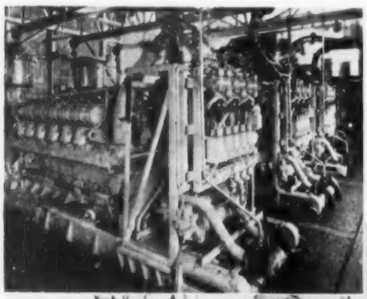
L. S. Pricher

Elects Pricher *VP*

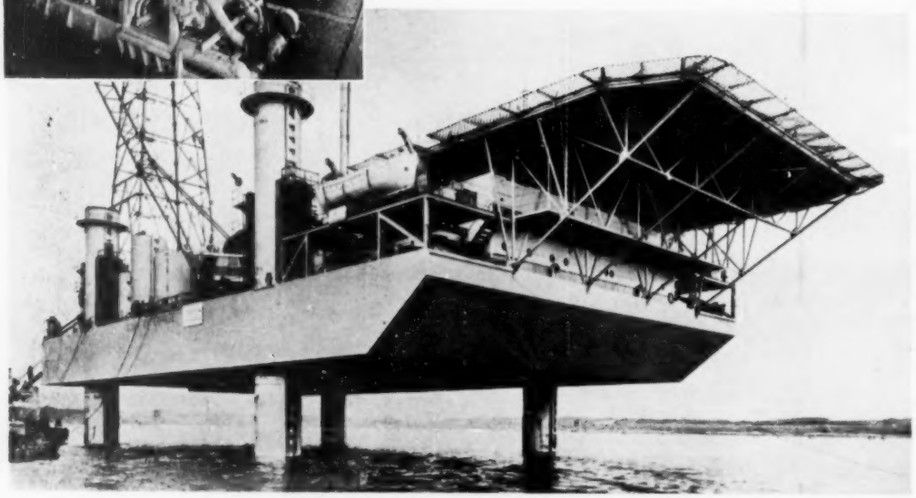
Foster Wheeler Corp. has announced election of Lawrence S. Pricher as vice president in charge of finance. He joined Foster Wheeler in 1946 as an accountant. Since then he has served as assistant controller, controller, and chief financial officer.

for Offshore Drilling in the Persian Gulf

The A.D.M.A. "Enterprise," built by Guttehoffnungshutte Sterkrade A.G. for Abu Dhabi Marine Areas, Ltd., has a National 130 draw-works powered by four Paxman 12RPH 400 s.h.p. Drilpak units (see inset). The drilling equipment was manufactured by Oil Well Engineering Co., Ltd., and is capable of drilling a hole 15,000 feet deep. The 440-volt main electricity supply is obtained from three 220 kw alternators, each driven by a Paxman 12RPH engine.



THE ILLUSTRATION BELOW SHOWS THE "ENTERPRISE" DURING THE TESTING OF THE RETRACTABLE LEGS. (B.P. photograph.)



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J.43

Arthur F. Endres (left), manager of the Whiting, Ind., refinery of Standard Oil Co. (Indiana) and J. C. Ducommun (right), manufacturing department general manager and a director of the company, with Dr. Robert E. Humphreys in front of the historic Burton-Humphreys experimental cracking still. Dr. Humphreys, working with the late Dr. William M. Burton in 1912, used the still at great risk to develop the thermal cracking process for breaking apart molecules of heavy oil by using heat and pressure to obtain twice as much gasoline from crude oil as had been possible previously. The Burton process was the key to today's complex petroleum catalytic processing methods used to make low-priced high-octane gasoline.

First Cracker to Smithsonian

Federal and state officials and the nation's automobile and petroleum-industry leaders paid tribute, October 27, to two pioneer scientists who 46 years ago found a way to double the amount of gasoline obtained from crude oil. They honored the late Dr. William M. Burton and Dr. Robert E. Humphreys, of Whiting, Ind., who developed the first petroleum cracking process in 1912.

The occasion was the presentation by Standard Oil Co. (Indiana) of the Burton-Humphreys experimental cracking still of 1912 to the federal government's Smithsonian Institution in Washington. The still will be part of a permanent display showing the growth of the petroleum industry in the United States. It was restored by the company as a memorial to the scientists. The memorial was presented in behalf of Standard Oil by J. C. Ducommun, a director, and general manager of manufacturing. It was accepted by Dr. P. W. Bishop, head curator of the department of arts and manufactures of Smithsonian.

Catalyst Regeneration With Oxygen

Cities Service Oil Co. has completed a series of tests at its East Chicago refinery in which oxygen was used to accelerate catalyst regeneration. Linde Co. assisted in the tests. Oxygen enrichments up to 27% by weight in the regeneration air were tried. Most data were assembled on the basis of adding 100 tons per day of oxygen, about 25.5%. Net effect at this concentration was to increase conversion by 5% at rated throughput or to increase throughput by 15%.

"Young" Memorial Award to Hamon

Establishment of the Carl A. Young Memorial Award and selection of Jake L. Hamon of Dallas, Texas, as the first recipient, has been announced by the Division of Production of the American Petroleum Institute. Mr. Hamon, well-known throughout the industry as an independent operator and as a former chairman of the API, received the award at the Institute's 38th annual meeting in Chicago in November. D. L. Connelly, vice president of Warren Petroleum Corp., Houston, and API vice president for production, said Mr. Hamon was honored specifically for his "exceptionally meritorious service to the petroleum industry over the past 22 years." He mentioned particularly Mr. Hamon's record during his tenure as API chairman in 1956 and 1957, and also his two terms as vice president for production in 1947 and 1948.

Burns World Congress President

H. S. M. Burns, president of Shell Oil Co. and API board chairman, has accepted the presidency of next year's meeting of the World Petroleum Congress. As congress president, Mr. Burns will preside at the more important functions planned for the meeting.

The congress, the fifth to be held in the past quarter-century, is scheduled for New York, May 30 to June 5, 1959, and is expected to draw 5,000 to 6,000 executives, scientists, and technologists from 50 countries.

Record Depth Perforating

Schlumberger Well Surveying Corp. recently set a new depth record by perforating the Phillips Petroleum Co. Montgomery A-1 in Pecos County, Texas. Over 900 shots were fired in an interval of 230 ft reaching to a maximum depth of 22,880 ft. Within the last several weeks the group had also run to depths approximating 23,000 ft an electrical log, a microlog, a radioactivity log, a laterolog, a dipmeter log, and a production packer.

J. L. Hamon

W. S. S. Rodgers

API Gold Medal Award

W. S. S. Rodgers, former president and retired chairman of The Texas Co., is the 1958 recipient of the American Petroleum Institute's "Gold Medal for Distinguished Achievement." Presentation was in Chicago at the Institute's 38th annual meeting.

New Gulf Department for Crude

Gulf Oil Corp. has announced that, effective October 15, the crude-oil department which was formed on September 1 became responsible for all sales, purchases, and exchanges of crude oil in the worldwide operations of the company. Jurisdiction for domestic crude-oil transactions was transferred from R. P. Huggins, vice president, to W. H. Blackledge, manager, crude-oil department, Western Hemisphere.

Harvester Tractor Catalog

International Harvester's complete line of new wheel tractors in six power sizes ranging from 12-hp to 72.5-hp for commercial and industrial use are described in a new 16-page catalog, *CR-174-H*, obtainable from International Harvester dealers, or by writing the Consumer Relations Department, International Harvester Co., 180 North Michigan Avenue, Chicago 1, Ill.

New 1958-59 officers of Desk & Derrick Club of Houston are (left to right) Miss Sophie Edmundson, Salt Dome Production Co., first vice president; Miss Florabel Hoke, Hebert-Byron-Trotter, treasurer; Mrs. Cleo Hopkins, Houston Slush Pump Repair Co., president; Miss Ida Lieskovsky, Humble Oil & Refining Co., second vice president; Mrs. Kathryn Romine, Texas Gas Exploration Corp., corresponding secretary; Miss Myrtle Heise, Humble Oil & Refining Co., recording secretary.

The New York Chapter of Nomads held its first open meeting of the fall season, October 6, in the Hotel Roosevelt. Seated (left to right) are J. A. Davidson, Caterpillar Tractor Co.; H. R. Walton, Fisher Governor Co, Ltd., London; J. Gleason, Caltex Services Ltd., London; G. W. Walton, Ideco, Dallas; R. S. Stephens, Mene Grande, Venezuela. Standing (left to right) are unidentified; E. Ragan, Creole Petroleum Corp.; P. D. Collins, London; Bob Thompson, East West Oil Tools, CA; E. Frias Rocha, Maquip, Brazil; G. Wilbur, Ideco, Dallas; Ben West, U.S. Steel Intl. Ltd., Brazil; A. Thomas, Maracaibo, Venezuela; J. Guillermo Ramirez, Airetool Manufacturing Co., Cuba.

GEODOME —A PORTABLE, ALL-WEATHER, SELF-ERECTING, SELF-SUPPORTING INSULATED SHELTER, IDEAL FOR FIELD WORK IN REMOTE AREAS

- **Air Inflated . . . Not Air Supported**
- **16.5 ft. in diameter**
- **8.3 ft. height at center**
- **218 sq. ft. unobstructed floor area**
- **Removable (zip-in) vinyl floor**

Geodome is a new concept in instantaneously erected portable housing units. Made of neoprene-coated nylon fabric and designed for pneumatic erection in a matter of minutes, the Geodome is light enough for two men to handle.

Geodome can support vertical loads up to 30 lbs. per square foot. When guyed, it will withstand wind velocities up to 120 miles per hour. Its dead-air-filled walls (2¾" thick) provide an insulation K factor of .17 BTU/hr./°F.—about that of a standard insulated wall.

Geodome is the ideal solution to the problem of temporary or permanent housing in inaccessible locations. It can be transported (collapsed) in a jeep, light plane, helicopter, or mule back. Accessory equipment includes gasoline powered 3 HP compressor for inflating Geodome, plexiglas storm windows, heater, air-cooler, etc.

Geodome is manufactured by the Berger Brothers Company, New Haven, Connecticut. Complete specifications, prices, delivery dates and other data are available now. Use the coupon at right for an immediate reply.

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ADVERTISERS' INDEX

(Advertising Agencies in Italics)

American Iron & Machine Works Co., Inc. — 21
Lowe Runkle Co.

A. E. Ames & Co. Ltd. — 12
MacLaren Advertising Co. Ltd.

Atlantic Refining Company — 7
N. W. Ayer & Son, Inc.

Automatic Telephone & Electric Co. Ltd. — 101
Dorland Advertising Ltd.

The J. B. Beaird Co., Inc. — 13
Glenn Mason, Cunningham & Associates

The Berger Brothers Company — 99
Ellington & Co. Inc.

Bethlehem Supply Company — 23
Gotham-Vladimir Advertising, Inc.

Born Engineering Company — 61
Watts, Payne—Advertising, Inc.

The British Petroleum Co. Ltd. — 69
S. H. Benson Ltd.

The Butterley Company Ltd. — 1
Rowlinson-Broughton

Cameron Iron Works, Inc. — Cover II
Boone & Cummings

The Cape Asbestos Co. Ltd. — 32-33
Taylor Advertising Ltd.

Catalytic Construction Co. — 54
Doremus-Eshleman Co.

Chance-Londex Ltd. — 92
Dixson's West End Advertising Agency Ltd

Chicago Bridge & Iron Co. — 19
Russell T. Gray, Inc.

Cities Service Oil Co. — 67
Ellington & Co. Inc.

M. J. Crose Mfg. Co., Inc. — 100
Paul Locke Advertising, Inc.

Davey, Paxman & Co. Ltd. — 98
Joughin Advertising Ltd.

Davison Chemical Co., Div. of W. R. Grace & Co. — 24
St. Georges & Keyes, Inc.

Dawson & Downie Ltd. — 92
James Jack Advertising Ltd.

Dowell — Cover IV
Rives, Dyke and Company

Dresser Industries, Inc. — 31
The McCarty Co. Advertising Inc.

Drilling Equipment Mfg. Co. — 78
Beals Advertising Agency

E. I. du Pont de Nemours & Co. (Inc.) — 17, 18
The Rumrill Co., Inc.

Esso Research & Engineering Co. — 25
McCann-Erickson, Inc.

Ethyl Corporation — 56-57
Young & Rubicam, Inc.

Evershed & Vignoles Ltd. — 93
E. Walter George Ltd.

Fish Engineering Corporation — 79
Rives, Dyke and Company

Geolograph Company — 4
Lowe Runkle Co.

Geophysical Service, Inc. — 91
Auld Advertising

Graver Tank & Mfg. Co., Inc. — 30
Ladd, Southward & Bentley, Inc.

Gulf Oil Corporation — 22
Ketchum, MacLeod & Grove, Inc.

Halliburton Oil Well Cementing Co. — 36
Heintz & Company, Inc.

Herb J. Hawthorne, Inc. — 94
Darwin H. Clark Co.

Hewitt-Robins, Inc. — 26-27
Fuller & Smith & Ross Inc.

Hughes Tool Company — 18a, 18b
Foote, Cone & Belding

Imperial Chemical Industries Ltd. — 87
Clifford Martin Ltd.

International Paints Ltd. — 95
Mayfair Advertising Ltd.

International Standard Electric Corp. — 16
J. M. Mathes, Inc.

M. W. Kellogg Company — 11
Fuller & Smith & Ross Inc.

Lucey Export Corporation — 75
Sam J. Gallay Advertising

The Lummus Company — 2, 3
G. M. Basford Co.

McCullough Tool Company — 77
Raymond O. Perry, Advertising

Metaducts Ltd. — 84
J. Peers & Associates Ltd.

Mid-Continent Supply Co. — Cover III
Magnussen Advertising Agency

Mission Manufacturing Co. — 71
Rives, Dyke and Company

Lee C. Moore Corporation — 35
Paul Locke Advertising, Inc.

D. Napier & Sons Ltd. — 96
C. R. Casson Ltd.

Newman, Hender & Co. Ltd. — 102
Adams Bros & Shardlow Ltd.

Petrolite Corporation — 29
Batz-Hodgson-Neuwoehner Advertising Agency

H. J. Porter Company, Inc. — 97
Erwin Wasey, Ruthrauff & Ryan, Inc.

Procon Incorporated — 80
Tobias, O'Neil & Gallay, Inc.

Ruston & Hornsby Ltd. — 89
Industrial Publicity Service Ltd.

Schlumberger Surenco — 53
Rives, Dyke and Company

Security Engineering Div., One of Dresser Industries — 34
The McCarty Co. of Texas, Inc.

Standard Oil Company (New Jersey) — 73
McCann-Erickson, Inc.

Stone & Webster Engineering Corp. — 85
Harold Cabot & Co., Inc.

Sunvic Controls Ltd. — 83
Crane Publicity Ltd.

Temperature Limited — 28
J. Peers & Associates Ltd.

Universal Oil Products Co. — 8-9
Tobias, O'Neil & Gallay, Inc.

Universal Oil Products Co., Products Dept. — 20
Tobias, O'Neil & Gallay, Inc.

Williams Brothers — 82
Benton Ferguson and Associates

The Youngstown Sheet & Tube Co. — 14-15
The Griswold-Eshleman Co.

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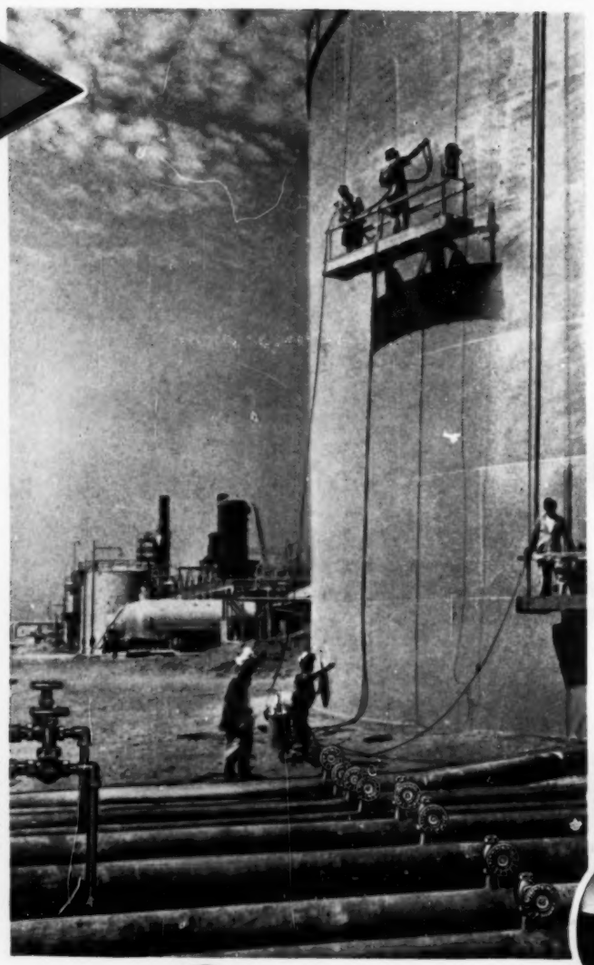
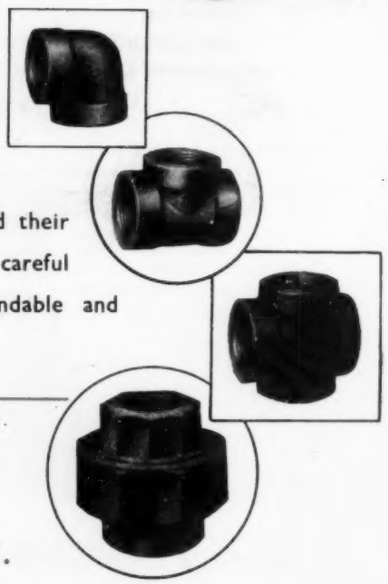


Newman, Hender Forged Steel Valves on the British Petroleum Company's Aden Refinery

Perfect Control



is secured with Newman, Hender Forged Steel Valves in many of the larger refineries. The valves are tested and tried at every stage of manufacture and all standard bodies are machined from solid drop forgings. NH Forged Steel Valves are tight at all times and their maintenance cost is negligible. It is their quality and meticulously careful manufacture that makes them so dependable and justifiably popular with oil engineers.

—valves are tested at every stage of manufacture.

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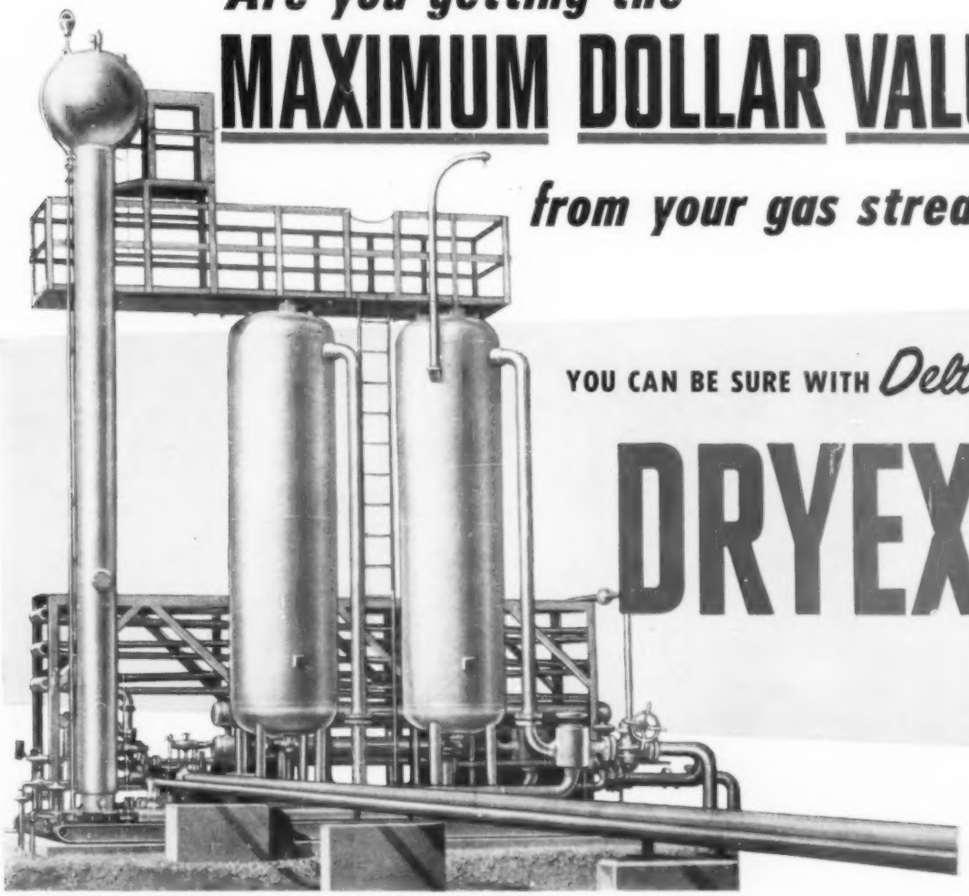

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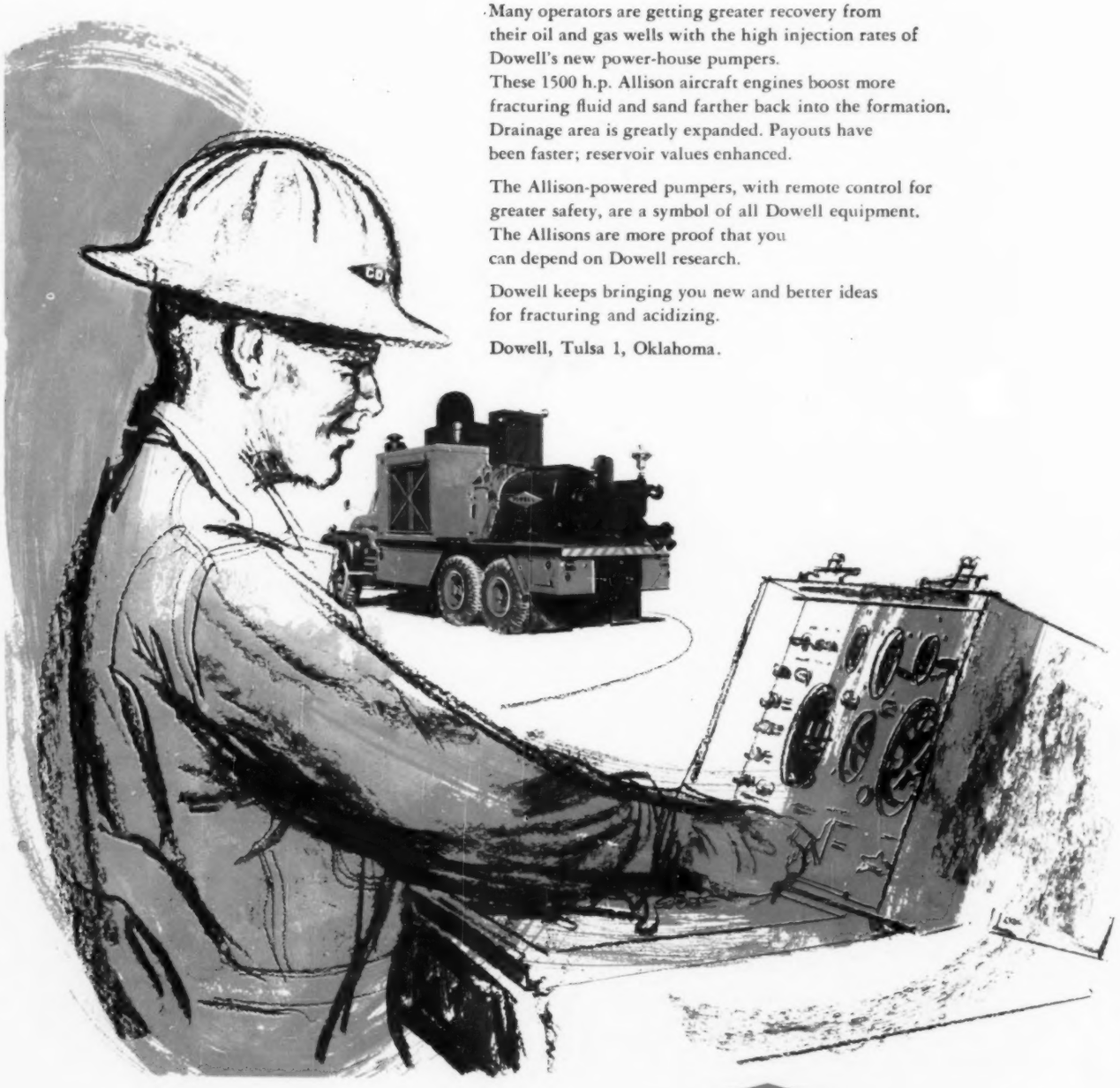

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